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ABSTRACT

As part of an evaluation of the Missouri master plan for higher education, changes affecting instructional programs in public four-year institutions in the state are reviewed for the period 1972-1982. Attention is directed to headcount enrollment and instructional programs, degrees conferred, new program development and degree productivity, and productivity measures. During the 10-year period, aggregate data show that total enrollments at all degree levels increased 14.3 percent, while total degrees awarded remained almost unchanged at 0.9 percent. Although graduate enrollments decreased, the proportion of part-time students in graduate programs at the University of Missouri system increased greatly. Public four-year institutions have been active in the development of new academic programs: between 1972 and 1982 the net number of new program additions at all levels increased 31.8 percent. At all public four-year institutions statewide, full-time instructional and research staff increased 2.4 percent. Five measures of productivity are addressed: instructional expenditures adjusted for inflation, full-time instructional/research staff, credit hours produced, credit hours per full-time instructional/research staff, and expenditures per credit hour. (SW)

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TRENDS IN INSTRUCTIONAL PROGRAMS AT MISSOURI PUBLIC FOUR-YEAR INSTITUTIONS 1972-1982

MASTER PLAN III ASSESSMENT PROJECT REPORT NUMBER FIVE

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MISSOURI PUBLIC FOUR-YEAR COLLEGES AND UNIVERSITIES

Central Missouri State University

Harris-Stowe State College

Lincoln University

Missouri Southern State College

Missouri Western State College

Northeast Missouri State University

Northwest Missouri State University

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- West Plains Residence Center

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- University of Missouri-Rolla
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PUBLIC COMMUNITY/JUNIOR COLLEGES

Crowder College

East Central College

Jefferson College

Metropolitan Community Colleges
- Longview Community College
- Maple Woods Community College
- Penn Valley Community College
- Pioneer Community College

Mineral Area College

Moberly Area Junior College

St. Louis Community College
- St. Louis Community College at Florissant Valley
- St. Louis Community College at Forest Park
- St. Louis Community College at Meramec

State Fair Community College

Three Rivers Community College

Trenton Junior College

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Foreword

The steady decline in state and federal support of higher education prompted the Missouri Coordinating Board for Higher Education in December 1981 to direct its staff to evaluate the State Master Plan for Higher Education, **Master Plan III**, published in 1978.

The Master Plan III Assessment Project was organized to describe major trends in Missouri over the past several years and the implications of these trends for higher education; to project the trends for the future and their implications for higher education in Missouri; and to specify a range of public policy alternatives available to the educational and political decision makers who hold the responsibility for higher education.

The issues of access, diversity, and funding comprise the major areas of study for the Master Plan III Assessment Project and are the issues for which public policy alternatives will be developed. This report is the fifth descriptive report on the trends in Missouri higher education.

Shaila R. Aery
Commissioner of Higher Education

EXECUTIVE SUMMARY

This report is the fifth in a series devoted to an assessment of **Master Plan III for Postsecondary Education in Missouri,** and its purpose is to provide an overview of changes affecting instructional programs that have occurred at Missouri's public four-year institutions between 1972 and 1982. The Master Plan III Assessment Project seeks to determine the impact of recent fiscal reductions at the state level on the issues of access, institutional diversity, and funding equity by primarily considering these topics along the dimensions of enrollment patterns, program mix, and institutional resources. This report summarizes the descriptive information on each of these indices as they relate to instruction and offers a number of observations, but no summary conclusions regarding the primary issues have been drawn at this time. This latter task will be accomplished after the assessment project reports have been completed.

Superficially, the period between 1972 and 1982 was a time of only modest change for the public four-year institutions. Aggregate data show that total enrollments at all degree levels increased 14.3% while total degrees awarded remained almost unchanged at 0.9%. Measured against the vigorous growth of the 1960's, these figures seem quite modest; yet, these simple statistics mask many significant changes both within and among the institutions. Not surprisingly, more detailed data reveal that the institutions experienced these changes differentially and that some of these changes have undoubtedly had genuinely profound effects on the future of individual institutions. The weight of this evidence suggests that the present summative assessment of public higher education at the state level being conducted by the Coordinating Board is well-timed. The following are highlights of these detailed findings.

Headcount Enrollment and Instructional Programs

Total headcount enrollment was quite variable between 1972 and 1982. At the graduate level, it was especially volatile. Total enrollment at all public four-year institutions peaked in 1975, and not until 1980 was this total exceeded. Graduate enrollment also peaked in 1975, but it has not recovered

and has, in fact, continued a sharp decline. Much of this loss in graduate enrollment has occurred at the regional institutions. The proportion of part-time students enrolled changed significantly during the period, but in ways that might not be expected by many observers. At the undergraduate level, part-time enrollment rose substantially at all institutions, but the effect was greater for the University of Missouri system which by 1974 consistently enrolled more part-time undergraduates than the other four-year institutions. Furthermore, this increase reached a plateau early in the period and has remained relatively steady since that time. At the graduate level, part-time enrollment has increased very sharply for the University of Missouri system while declining at the regional institutions. These shifts have been so great that the proportion of part-time graduate students at both types of institutions are approximately equal. Among the several observations that the enrollment data suggest are the following:

- The diminishing size of graduate enrollment, especially at the regional institutions, raises questions about the ability of formal graduate programs to deliver continuing education to professionals and other adult learners who want to maintain or upgrade their skills as technological advances transform the work place.

- The greatly increased proportion of part-time students in graduate enrollment at the University of Missouri system could have long-term effects that would tend to converge the missions and purposes of graduate instruction at the regional institutions and the university.

- The anticipated increase in part-time and nontraditional students at the undergraduate level in four-year institutions may have already occurred in the early 1970's, and a further expansion of this segment of the student market may not occur to soften the projected decline in higher education enrollment as many institutional leaders have hoped.

Degrees Conferred

One would anticipate that degrees conferred would follow trends established by enrollment, and, generally speaking, this result was observed. There were, however, some surprises in the data. Although total headcount enrollment increased 14.3% over the period 1972-1983, degrees conferred at all levels increased only 0.9%. Since growth in degrees conferred always lags behind enrollment growth because of the time it takes a student to complete a degree program, part of this disparity is explained by this effect. However, even after allowance is made for this factor, the difference between growth in enrollment and degrees appears to be on the order of 4% to 5%. Degrees, like enrollment, showed significant variability between institutions and degree levels, but these changes did not always parallel shifts in enrollment patterns. For example, master degree awards increased 9.7% at the regional institutions and declined 12.0% at the University of Missouri while total graduate enrollment was declining and the regionals were losing market share at the graduate level to the university system.

Even more significant than these trends are the facts that very major changes occurred in the distribution of degrees awarded among the academic disciplines and that these shifts varied between institutions and degree levels. For all public four-year institutions as a group, eight baccalaureate disciplines declined while twelve increased. The largest gains in the actual number of degrees conferred were recorded in business and management, engineering, public affairs, and agriculture while the greatest decreases were recorded by education, social sciences, letters, and mathematics. Similar variations in degrees awarded were discovered at the master degree level. Among the observations these data suggest are the following:

- Although very little change occurred in the total number of degrees awarded at all levels, very significant shifts occurred at different degree levels and among discipline areas of study. The data confirm that these changes impacted on the institutions differentially.

- The data suggest that degree productivity has not kept pace with enrollment growth. The disparity between these growth rates may

indicate that the changing character of the student body has created needs for student services that are currently unmet and must be addressed before the degree completion rate can be raised.

- There are indications in the data that the institutions have developed adaptive mechanisms that tend to level the peaks and valleys of annual enrollment shifts. The nature of these mechanisms, if they exist, are not revealed by the data, but their presence or absence is an important planning issue.

- The significant shifts in the distribution of degrees granted among the academic disciplines that have occurred in response to changes in student interests suggest that the public four-year institutions have been very active in redirecting institutional resources to growth areas during the period 1972-1982.

New Program Development and Degree Productivity

Comparison of the official program inventories for 1972 and 1982 indicates that the public four-year institutions have been very active in the development of new academic programs. Between 1972 and 1982 the net number of new program additions at all levels increased 31.8%, and this figure does not attempt to account for the plethora of concentration options within degree programs that have been developed for many majors. This activity probably has its roots in a number of causes, but the most significant would be the institutions' desire to accommodate the increasing interest of students in career education; the desire to overcome sluggish enrollment trends by offering students programs closely tailored to their specific interests; and, finally, the desire of the state universities and state colleges to diversify their curricula as student interest in teacher education programs waned. While this diversification program probably achieved the goals of its proponents and certainly extended geographic access, it had at least one unintended consequence: a large number of degree programs producing very few graduates. Between 1979 and 1982 it is estimated that 47.9% of all baccalaureate programs at Missouri's public four-year institutions produced

five or fewer graduates annually. During this period only four discipline areas consistently had fewer than 25% of their programs in this low production category. The following observations are suggested by this information:

- The resource reallocations that have occurred at the institutions between 1972 and 1982 have been used largely to sustain new program development.

- Programmatic growth has exceeded degree productivity growth and has resulted in many degree majors with low productivity in terms of degrees granted annually. Although some proportion of low productivity programs will always exist due to the fact that some disciplines fulfill service functions within the institutions, currently available data suggest that the present number of very small programs is excessive.

- The proliferation of degree programs raises questions concerning the intellectual consequences of this curricular segmentation and the ability of many small programs to generate a sufficient critical mass of students to assure quality educational experiences.

Productivity Measures

The cumulative weight of the information gleaned from the analysis of enrollment, degrees, and new programs data -- especially when they are evaluated in the context of declining state support -- suggests that the Coordinating Board and the institutions should focus greater attention on the productivity of higher education's instructional programs. To illustrate the possibilities for this type of analysis, this report has identified five measures of productivity:

- Instructional Expenditures Adjusted for Inflation
- Full-time Instructional/Research Staff
- Credit Hours Produced

- Credit Hours per Full-time Instructional/Research Staff
- Expenditures per Credit Hour

This report has used a model that classifies all academic disciplines on four dimensions. This model enables anyone to identify the relative standing of each discipline in comparison to all others, to determine where institutions are tending to concentrate their instructional resources, and to make preliminary judgments regarding an individual discipline's potential for reduction or additional investment.

The analysis of these measures demonstrates that there were wide variations of performance among the several disciplines while the aggregate differences between institution types were small. Between 1979 and 1982 at all of the public four-year institutions statewide, full-time instructional and research staff increased 2.4%, inflation adjusted expenditures decreased 6.0%, credit hours increased 11.2%, credit hours per full-time instructional staff increased 8.6%, and inflation adjusted expenditures per credit hour decreased 15.5%.

At the state level, inflation adjusted expenditures per credit hour increased in only three disciplines and remained constant in only one other. The classification model produced the following level of agreement in the categorization of all disciplines for the university system, the state colleges and universities, and the public four-year sector as a whole: disciplines currently receiving significant infusions of resources with respect to growth, business; disciplines that might be logical targets for reallocation of resources, home economics and public affairs; disciplines that might be logical investment opportunities, computer science, engineering, mathematics, and interdisciplinary studies; and disciplines that might be weakening to the point where viability and quality are at issue, physical sciences. Given these facts, the following observations are warranted:

- The proliferation of degree majors, significant shifts in student interests, a decade of inflationary pressure, and declining state support have produced a radically altered environment for the higher education community which will demand a high degree of management skill to preserve the quality of the educational product.

- The pattern established by the institutions' performance on the productivity measures suggests that modest staff additions have been funded from real dollar increases while per unit support in constant dollars of base activities has been permitted to erode. Continuation of this trend could seriously injure the institutions' ability to sustain high quality in their instructional programming. Nevertheless, institutional productivity in terms of credit hours per full-time instructional/research staff and expenditures per credit hour rose appreciably.

- Although no quantitative classification model alone can evaluate disciplinary programs out of their institutional contexts, the model developed for this report seems to be a valuable conceptual tool for the institutions and the Coordinating Board for Higher Education as they attempt to clarify the fiscal status of specific programmatic areas.

A Note on Data

Most of the data used in this report have been collected directly from the institutions through the Coordinating Board's customary data collection procedures. In a few limited cases missing data items have been completed with information published by the National Center for Education Statistics (NCES). Data for degrees conferred for 1975 and 1976 have been provided by the National Center for Higher Education Management Systems (NCHEMS). NCHEMS data are derived from NCES reports and are compatible.

The data presented in this report are reliable and can be very useful for broad trend analyses; but undue emphasis should not be placed on small differences in the aggregated observations. Much of the data that have been analyzed in this study are presented in graphic form to illustrate changing relationships through time in the factors related to instructional programs.

HEADCOUNT ENROLLMENT AND INSTRUCTIONAL PROGRAMS

It is almost inconceivable that any trend analysis of instructional programs at public institutions could begin at a point other than enrollment or its first cousin, credit hour production. The legacy of the spectacular growth of the 1950's and 1960's has been a fascination with enrollment growth. This natural tendency has been reinforced by funding formulas that have been wholly or partially enrollment driven. Finally, now that higher education's period of expansion is at an end, planners are trying to anticipate the effects of projected enrollment declines. As important as quality and access are to educational planners, enrollment and programs are inseparable.

The percentage change in headcount enrollment for the period 1972-1982 is exhibited in Display 1. Two important facts are evident: first, the overall growth rate of 14.3% for this period is much more modest than comparable rates in the 1960's when enrollment more than doubled; second, graduate enrollment declined slightly for all of the institutions during the period and actually dropped sharply at the regionals. This latter point raises important questions about the widely shared assumption that working professionals and other nontraditional students will be more willing to avail themselves of graduate study opportunities to keep abreast of their fields or to enhance their opportunities for occupational mobility. This potential market clearly did not materialize for Missouri's public four-year institutions in the 1970's and early 1980's.

DISPLAY 1
PERCENT CHANGE IN HEADCOUNT ENROLLMENT
MISSOURI PUBLIC FOUR-YEAR INSTITUTIONS, 1972-1982

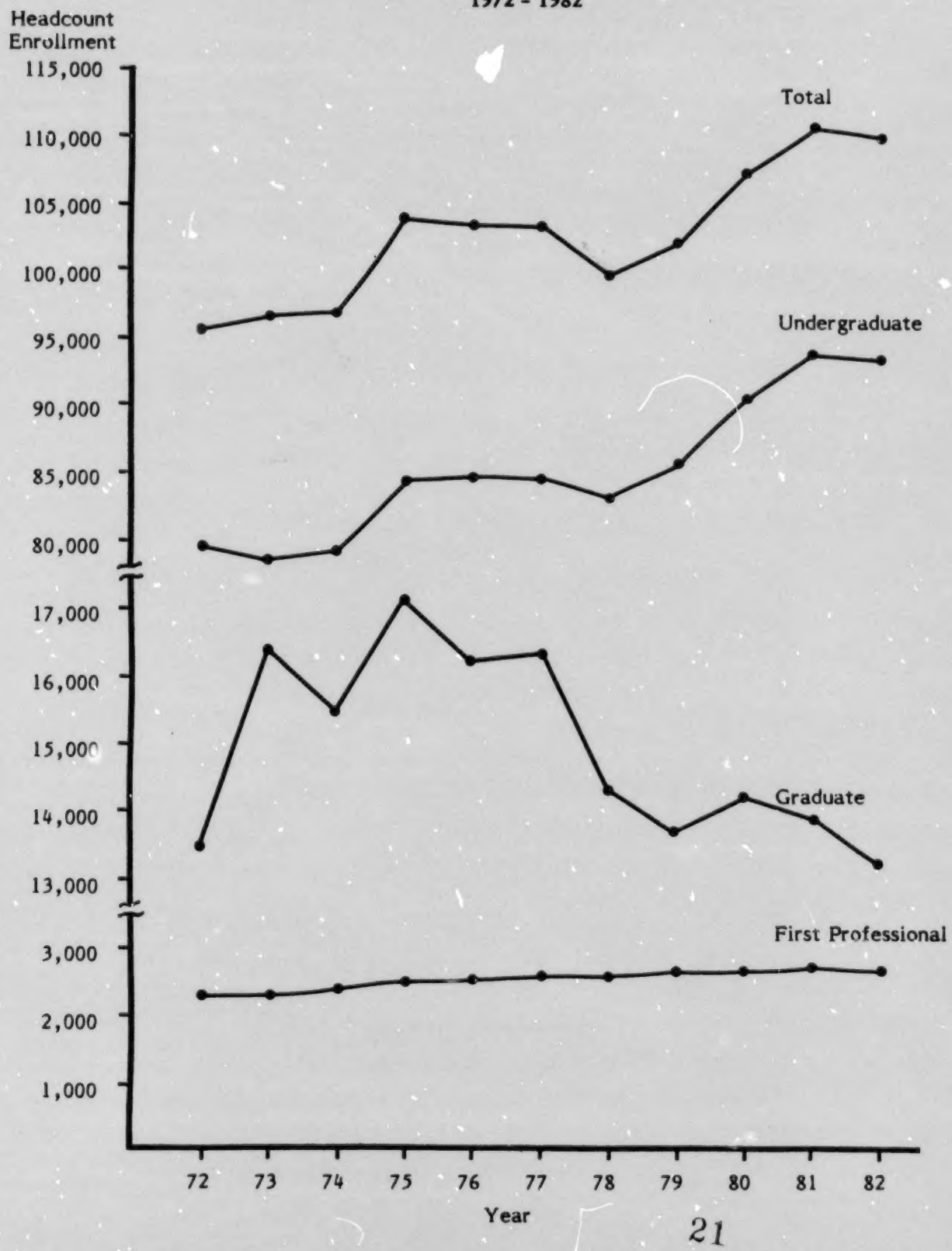
	UM	All Others	Combined Total
Undergraduate	17.8	16.6	17.1
Graduate	10.7	(22.0)	(1.8)
First Professional	13.3	N.A.	13.3
All Levels	16.3	12.5	14.3

N.A.: Not Applicable

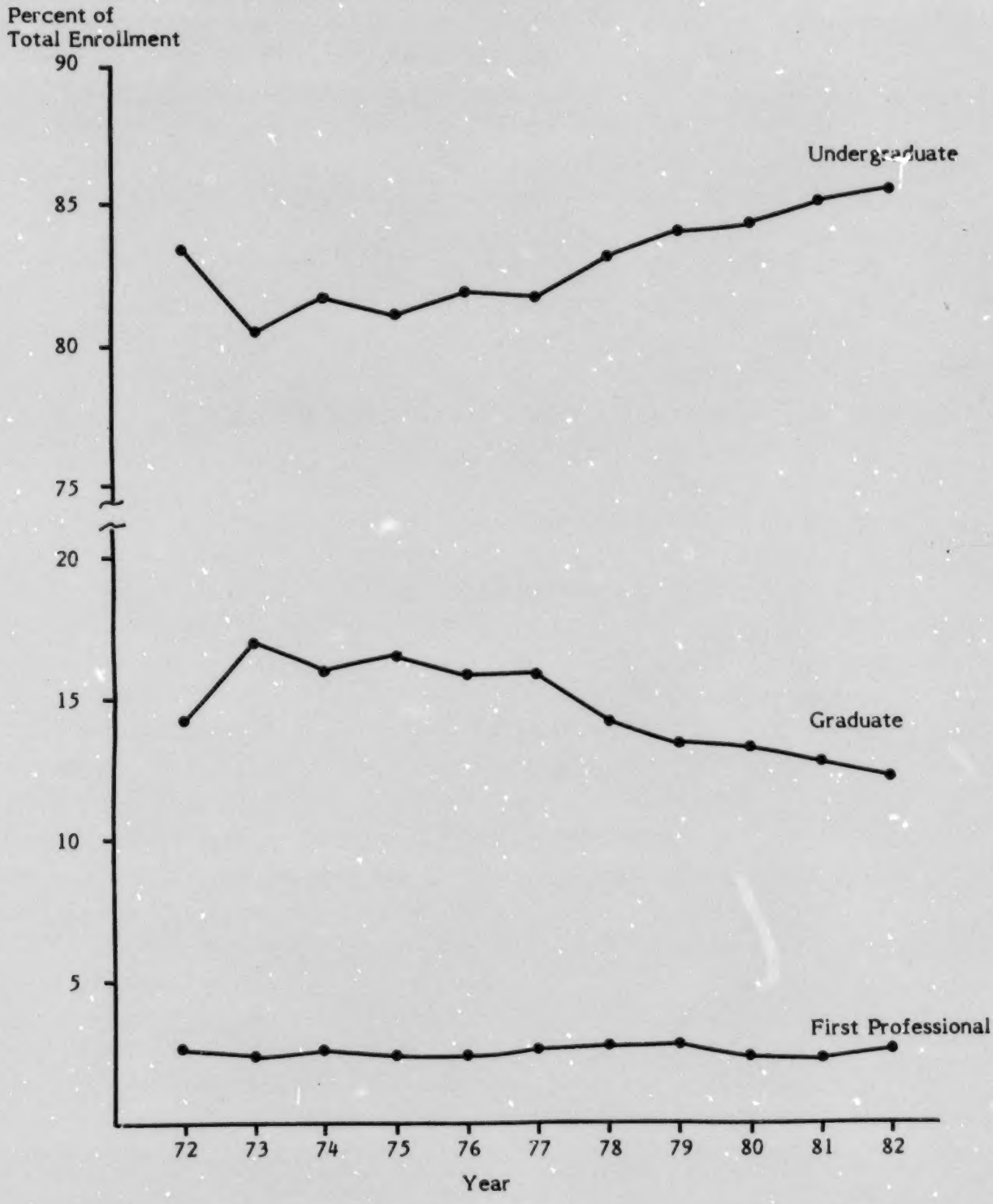
The data included in Displays 2 and 3 demonstrate that enrollment in this period was somewhat volatile, especially at the graduate level. Undergraduate enrollment declined slightly at first, but recovered rather quickly only to plateau for three consecutive years and then decline marginally. From 1978 to 1982 undergraduate enrollment increased steadily before declining slightly in 1982. Taking into consideration the Coordinating Board's projections of enrollment declines in the 1980's (See **Master Plan III Assessment Project Report Number Three**), the 1981 enrollment peak may be the highest for public four-year institutions as a group until the next century.

Given the preponderance of undergraduate enrollment as a percentage of all enrollment, the trend for total enrollment follows closely the trend for undergraduate enrollment. First professional enrollment increased steadily during the period, but its percentage share of the total was almost unchanged. Interestingly, graduate enrollment reveals a very different picture from either of these patterns. Graduate enrollment rose very rapidly from 1972 to 1975, increasing 27.0% in three years. From that point, however, it entered into a steady decline until it was actually lower in 1982 then in 1972. In terms of graduate education's percentage share of total enrollment, a peak of 17.1 percentage points was reached in 1973. The subsequent decline of 28.7% may be partially explained by the weakening of teacher education and the liberal arts as attractive fields of study, but full explanation of this phenomenon is not readily apparent.

DISPLAY 2
HEADCOUNT ENROLLMENT TRENDS
MISSOURI PUBLIC FOUR-YEAR INSTITUTIONS
1972 - 1982



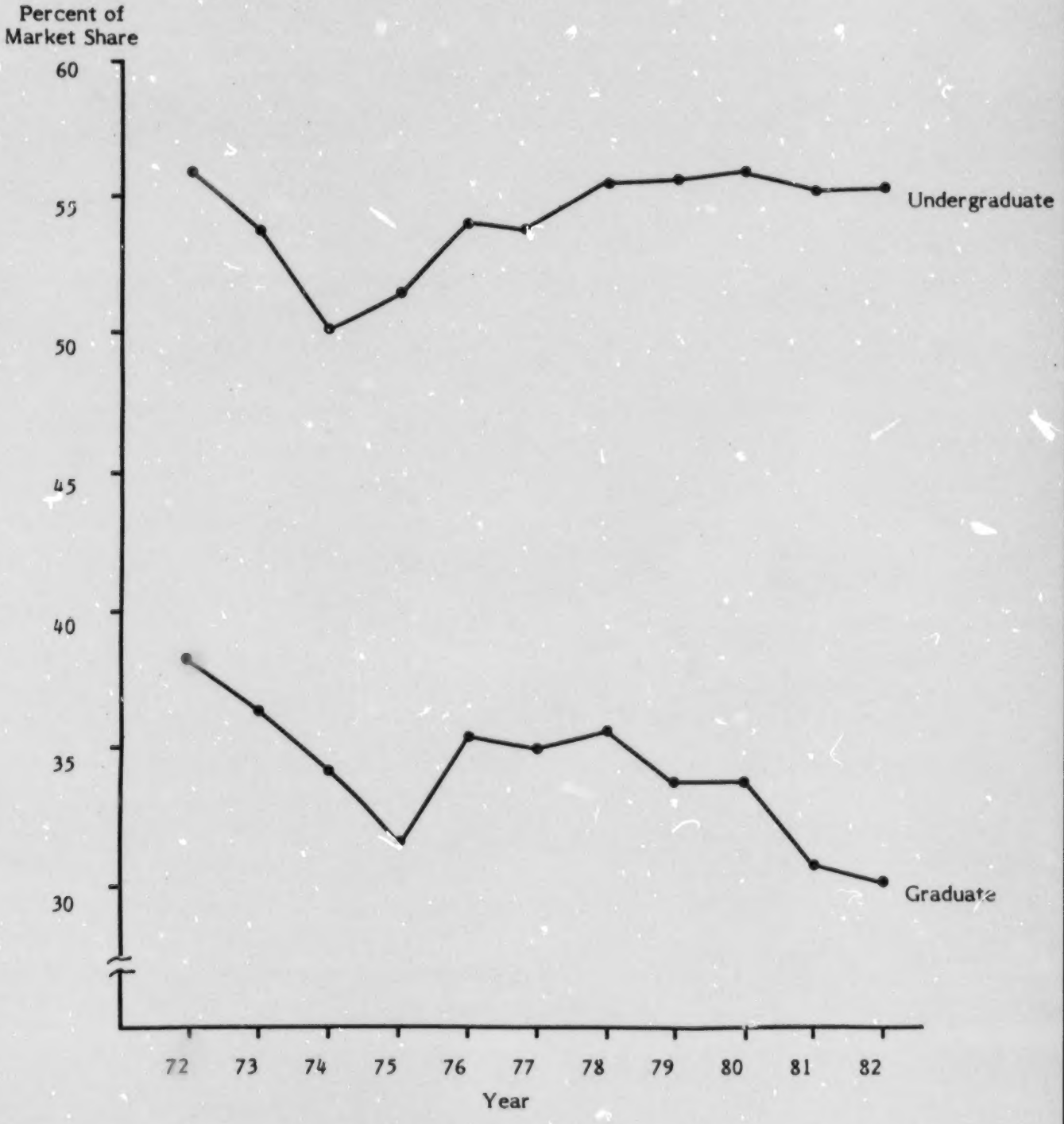
DISPLAY 3
PERCENT DISTRIBUTION OF HEADCOUNT ENROLLMENT
MISSOURI PUBLIC FOUR-YEAR INSTITUTIONS
1972-1982



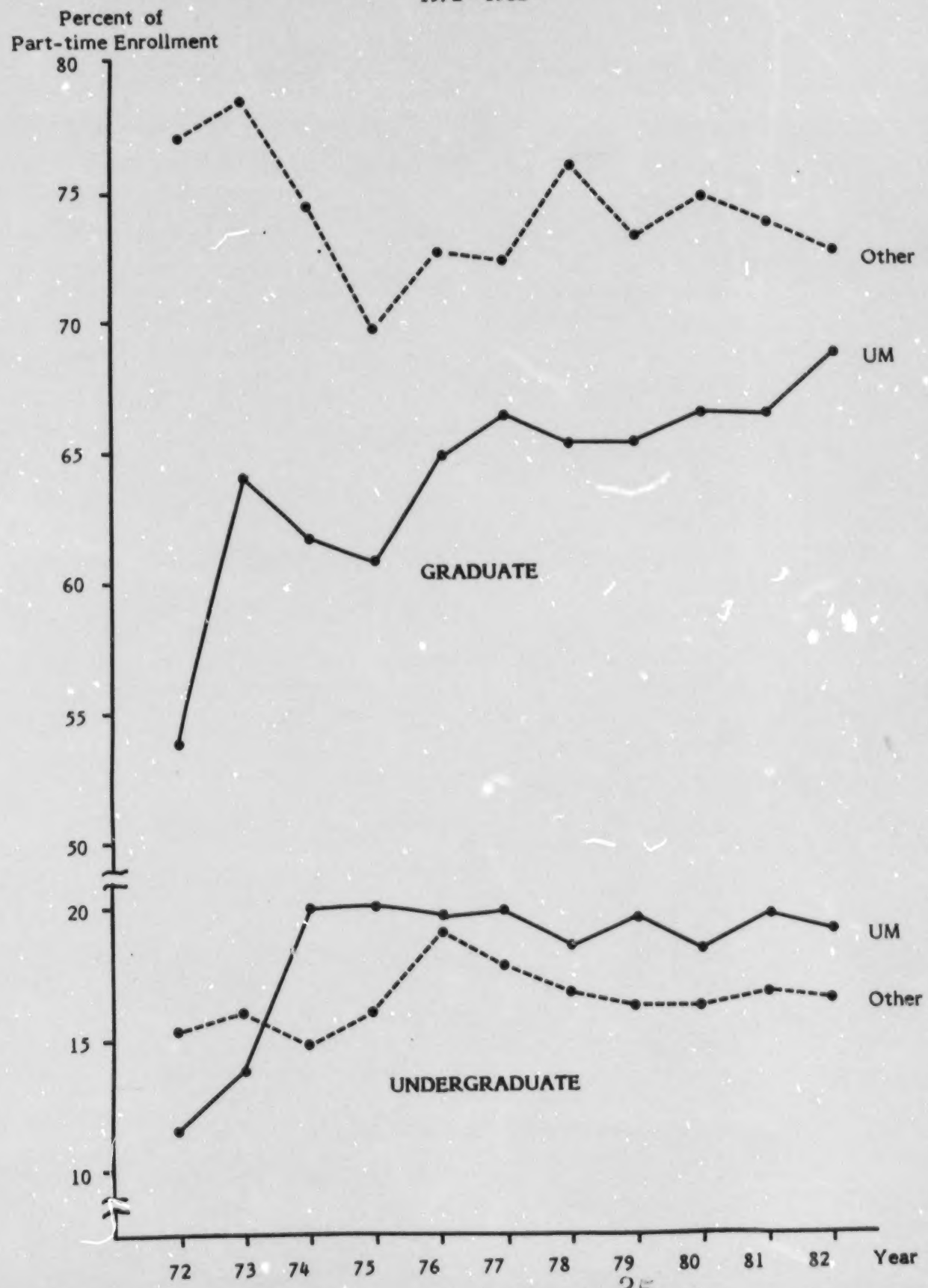
As noted previously, Display 1 reveals that the decline in graduate enrollment was centered at the regional state universities, and this fact is verified in Display 4. The regional universities' market share of all graduate students enrolled in Missouri's public four-year institutions declined from 38.2 percentage points in 1972 to 30.3 percentage points in 1982 for a cumulative decline of 20.7%. Surprisingly, in the early 1970's the regional institutions were also losing market share to the University of Missouri at the undergraduate level. This trend was reversed in 1974, and these institutions have maintained a steady undergraduate market share in the range of 55 - 56 percentage points since 1978. In an era of general growth, the concept of market share within the public sector did not receive careful attention, but these data -- when combined with the Board's enrollment projection's for the 1980's and 1990's which predict differential institutional impacts -- suggest that this phenomenon should be monitored more carefully in the future.

The available data permitted investigation of the role of part-time students in enrollment patterns during the 1970's and early 1980's, and these results are shown in Display 5. At the undergraduate level, part-time enrollment increased at both the regional institutions and the University of Missouri. Interestingly, the rise at the university was much sharper, and as early as 1974 the university system was enrolling a larger percentage of part-time undergraduates than the regional institutions. Although this result seems somewhat counterintuitive at first, consideration of the urban locations of the University of Missouri-Kansas City and the University of Missouri-St. Louis combined with the relatively rural and small town locations of most of the regionals makes this circumstance understandable. Of greater significance is the fact that both of the undergraduate trend lines leveled off in the mid-1970's. It has been the conventional wisdom that part-time, nontraditional students will play an increasingly significant role in higher education in coming years. While this prediction may be accurate for other educational sectors, or other degree levels, these data suggest that at the baccalaureate level at Missouri's public four-year institutions the transition has already occurred and the potential of this market segment may not be substantially expandable.

DISPLAY 4
PERCENT OF MARKET SHARE
FOR HEADCOUNT ENROLLMENT
MISSOURI PUBLIC FOUR-YEAR INSTITUTIONS
EXCEPT UNIVERSITY OF MISSOURI
1972 - 1982



DISPLAY 5
PERCENT OF PART-TIME HEADCOUNT ENROLLMENT
MISSOURI PUBLIC FOUR-YEAR INSTITUTIONS
1972 - 1982



The trend lines for graduate study are very revealing. Between 1972 and 1982 the percentage of part-time graduate students at the University of Missouri rose from 53.8 percentage points to 68.3 percentage points, an increase of 27.0% while the percent of part-time students at the regional institutions decreased by 5.3%. While the latter change is not insignificant, the former has probably altered the character of graduate education in the university system. This observation may be particularly relevant because 1) this change has occurred in a contracting graduate market, and 2) the increase in the percentage of part-time students is perhaps the consequence of traditional full-time students failing to register at former levels rather than the result of active recruiting efforts. It is important to note that the gap between the regional universities and the University of Missouri with respect to the percentage of part-time graduate students enrolled has nearly closed, and it will be important to the Coordinating Board and the higher education community generally to determine whether this phenomenon will portend a broader based convergence of institutional missions at the graduate level.

Summary Observations

In terms of real growth the years between 1972 and 1982 witnessed only moderate enrollment increases, especially when considered against the background of the 1960's. The most important developments have been the diminishing role graduate education has played in enrollment, especially at the regional institutions, as well as the long-term significance of greatly increased part-time enrollment on graduate programs at the University of Missouri. While continuing education for professionals and other adult learners will probably continue to gain in importance as technological advances spread throughout the economy and culture, these data suggest that formal graduate programs may not be the most marketable vehicle for providing this instruction. Furthermore, these data suggest that the anticipated increase in part-time enrollment at the undergraduate level has already occurred and that this segment of the student market may not be susceptible to further expansion as enrollment declines in the 1980's. Finally, this analysis confirms that enrollment trends affect institutional types differentially and suggests that future trends probably will continue to impact the institutions in significantly different ways.

DEGREES CONFERRED

Within the public community college sector of higher education many nontraditional learners enroll with limited goals and may not have the intention of completing a formal degree. As a consequence, degree productivity and degree completion rates are only a partial measure of a community college's success. Yet, in a period when the nontraditional learner is receiving increasing attention, completion of a degree program is still the normative expectation for students attending either the University of Missouri, one of the state universities, or one of the state four-year colleges. As a consequence, an analysis of instructional programs at the four-year institutions should devote careful attention to the question of degree productivity.

Display 6 shows the percentage change in degrees conferred between 1972 and 1982 while Display 7 provides a clearer understanding of the magnitudes of these changes and of the relative importance of the several degree levels to the public four-year institutions. Overall, the number of degrees conferred between 1972 and 1982 was almost unchanged with an increase of merely 0.9%. Formal awards actually decreased by 1.5% at the University of Missouri while they increased 3.5% at the regional institutions. As in the case of enrollment trends, the impact of change varied substantially between institution types and degree levels.

DISPLAY 6
PERCENT CHANGE IN DEGREES CONFERRED
MISSOURI PUBLIC FOUR-YEAR INSTITUTIONS, 1972-1982

	UM	All Others	Combined Total
Certificate	(38.1)	(16.3)	(20.1)
Associate	N.A.	65.4	65.4
Bachelor	2.6	0.6	1.5
Master*	(12.0)	9.7	(4.3)
Doctor	(31.4)	N.A.	(31.4)
First Professional	29.3	N.A.	29.3
All Levels	(1.5)	3.5	0.9

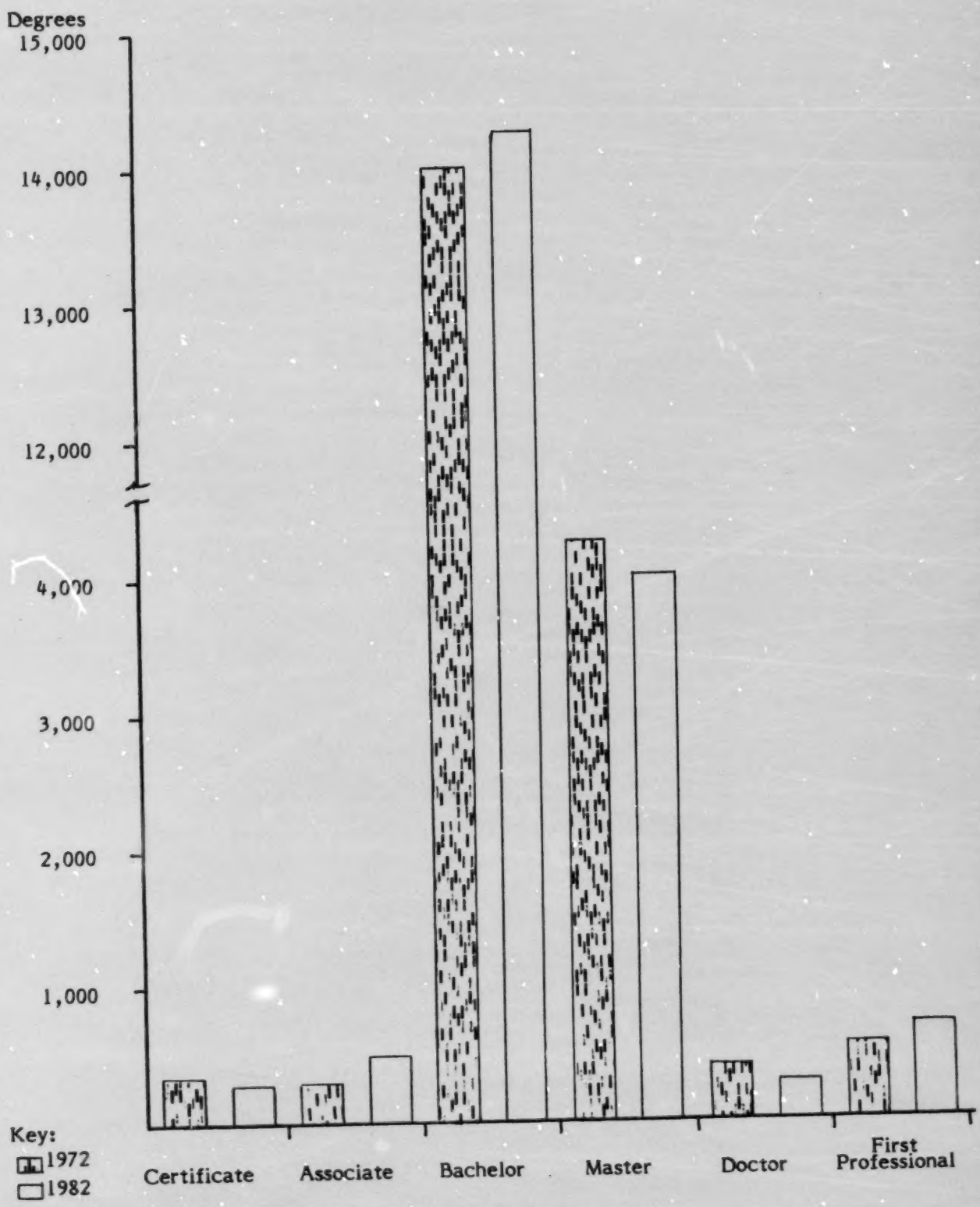
N.A.: Not Applicable

*Unless specified otherwise, all figures in this section that refer to master degrees include specialist degrees.

The most significant comparison revealed in Display 6 is that master degree awards increased 9.7% at the regional institutions and decreased 12.0% at the University of Missouri. This shift occurred during a period when total graduate enrollment was declining and the regional institutions were losing market share at the graduate level to the university system. Although the interpretation of this information is greatly complicated by the fact that degree trends lag behind enrollment trends because of the time it takes a student to complete a program, it is probable that the shifting patterns of part-time enrollment at the graduate level have had a pronounced differential impact on degree productivity.

A related observation concerns the disparity between a 14.3% growth rate in headcount enrollment and a 0.9% overall increase in degrees awarded. This disparity should receive more careful attention. After allowance is made for the fact that degrees lag behind enrollment by four to five years, this difference is reduced to 4% - 5%, but even this gap could be significant to the higher education community in the coming years as enrollment decreases.

DISPLAY 7
DEGREES CONFERRED
MISSOURI PUBLIC FOUR-YEAR INSTITUTIONS
1972 AND 1982

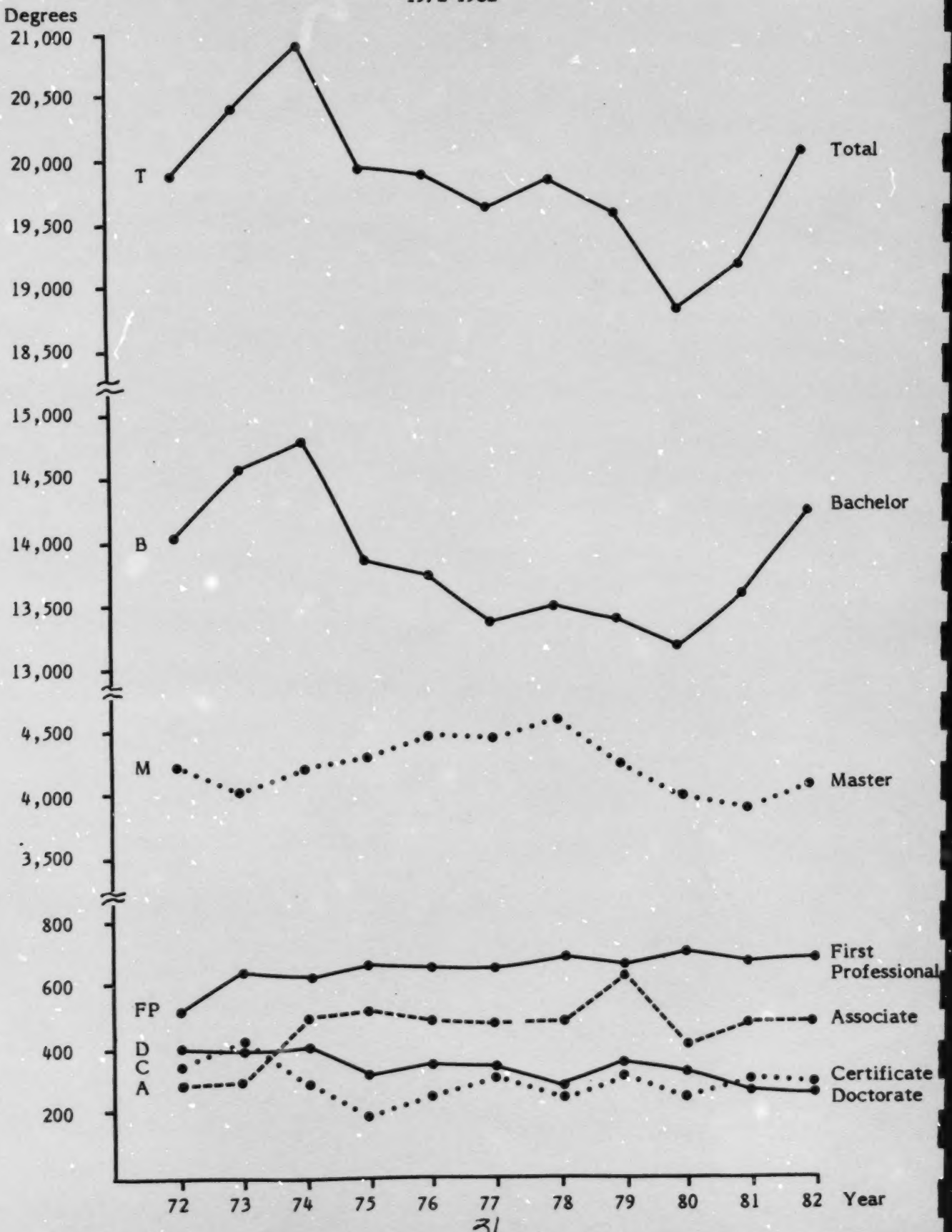


Although these data do not permit a fuller interpretation of this problem, it is possible that the character of a changing student body has created unmet needs for student services that may have to be addressed if the degree completion rate is to be increased.

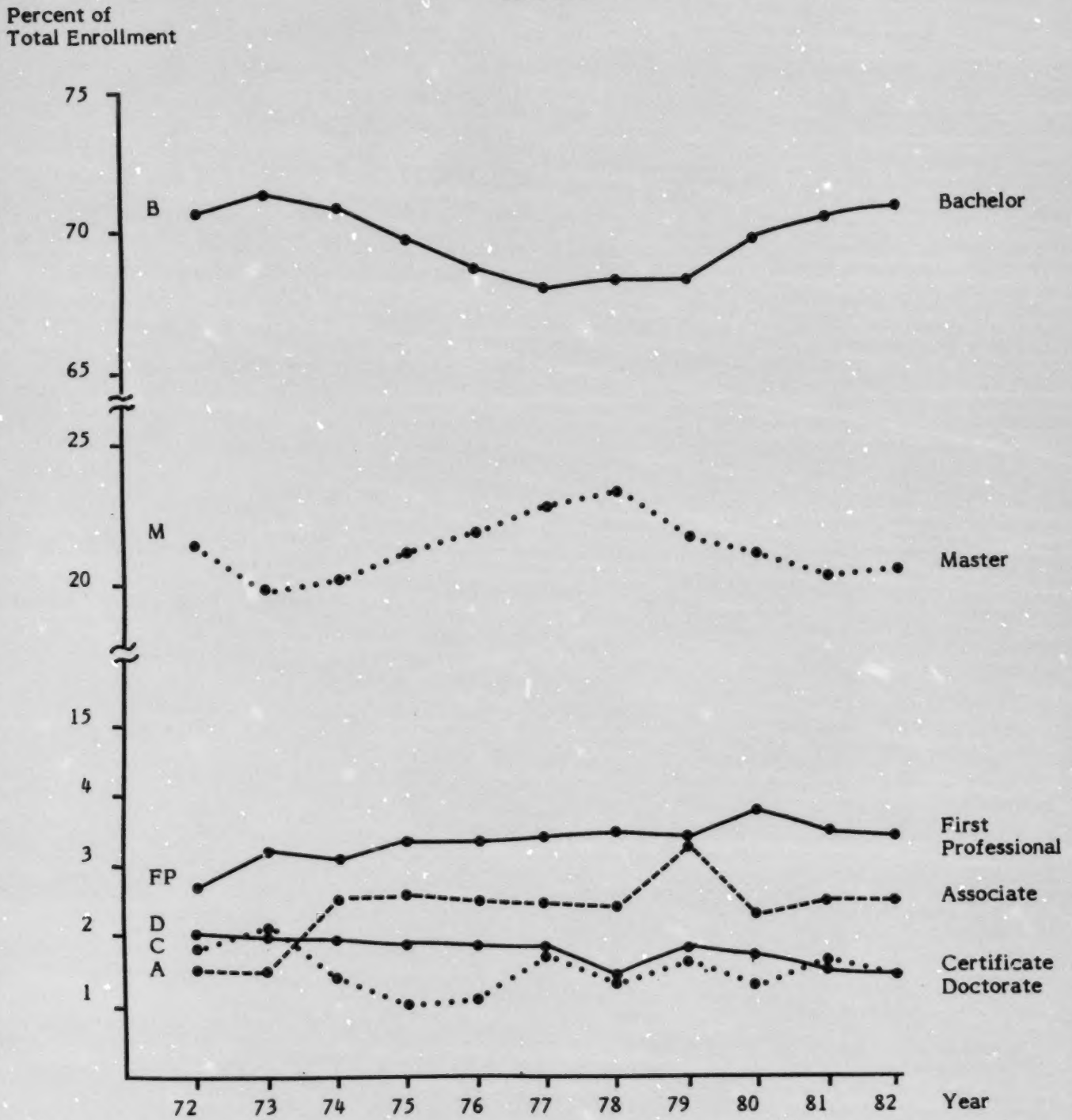
While comparison of formal awards made during the beginning and ending years of the study reveal only very moderate changes, it is clear from Displays 8 and 9 that significant variability occurred during the period under review. However, these graphs must be interpreted carefully. First, due to the lag between enrollment and degree trends, the data points for degrees awarded in a given year probably have little to no relationship to the enrollment figures for the same period. Second, the scale for degrees awarded in Display 8 was chosen to emphasize the variations that occurred during the period. However, if the same degree data were charted on Display 2 with the enrollment data, a sharp contrast would be evident since the peaks and valleys on the degree trend line would not be very pronounced. This situation suggests that the institutions have developed some adaptive mechanisms that tend to smooth the shifts of annual enrollment changes. A subject for future examination would be to determine if this perception is accurate, and, if so, how these mechanisms work.

Displays 10 and 11 provide some tenuous evidence that these adaptive mechanisms exist, and they also illustrate other dynamics that occur within instructional programs. First, keeping in mind the lag effect between degree and enrollment trends, it appears that the trends for degrees awarded at the undergraduate and graduate levels are somewhat more level than the comparable enrollment trends. Display 10 also vividly demonstrates the effect of differential attrition rates between undergraduate and graduate students. The former have a relatively high attrition rate so the trend line for the percentage distribution of undergraduate degrees is substantially lower on the graph than the line for the percentage distribution of undergraduate enrollment. Conversely, the attrition rate for graduate programs is much lower so the trend line for graduate degrees is much higher on the graph than the one for graduate enrollment.

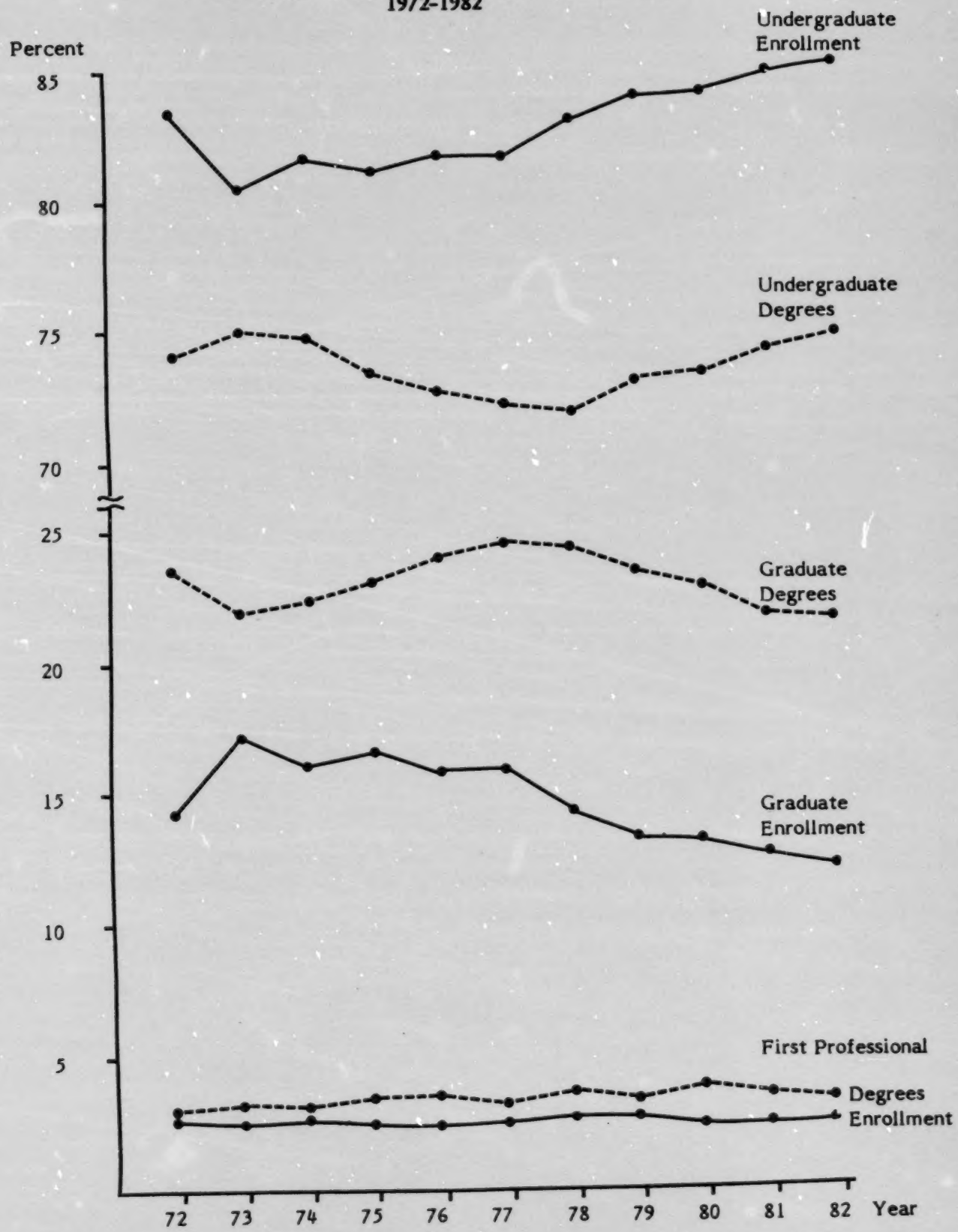
DISPLAY 8
DEGREES CONFERRED TRENDS
MISSOURI PUBLIC FOUR-YEAR INSTITUTIONS
1972-1982



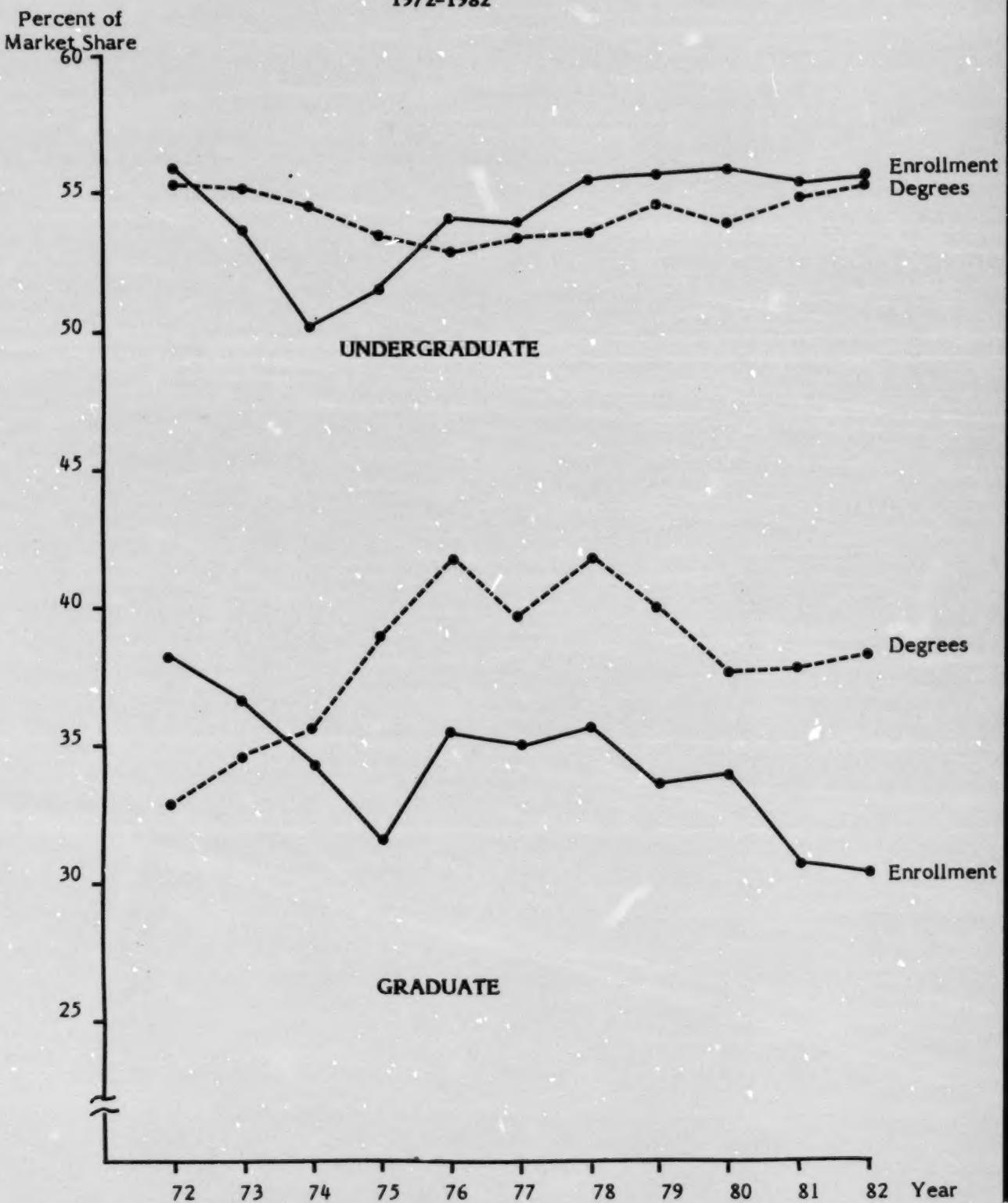
DISPLAY 9
PERCENT DISTRIBUTION OF DEGREES CONFERRED
MISSOURI PUBLIC FOUR-YEAR INSTITUTIONS
1972-1982



DISPLAY 10
COMPARISON OF
22 PERCENT DISTRIBUTION DEGREES CONFERRED WITH
PERCENT DISTRIBUTION HEADCOUNT ENROLLMENT
MISSOURI PUBLIC FOUR-YEAR INSTITUTIONS
1972-1982



DISPLAY 11
COMPARISON OF
MARKET SHARE OF DEGREES CONFERRED WITH
MARKET SHARE OF HEADCOUNT ENROLLMENT
MISSOURI PUBLIC FOUR-YEAR INSTITUTIONS
EXCEPT UNIVERSITY OF MISSOURI
1972-1982



With respect to Display 11, the periodic crossing and convergence of trend lines suggest institutional adjustments to enrollment shifts. This graph also confirms the interesting fact that since 1974 the completion rate for graduate students at regional institutions has been substantially higher than the rate for students attending the University of Missouri system. Undoubtedly, these differences are rooted in the differing purposes and clientele of these programs, but a better understanding of the differences would probably enhance the Coordinating Board's planning capability. Since degree trends lag behind enrollment trends, this graph also seems to predict that a sharp drop in graduate degree production at the regional institutions can be anticipated.

Notwithstanding the obvious complexities and variations in enrollment and degree trends when using aggregate data, these graphs do not reflect the turbulence in institutional curricula that occurred between 1972 and 1982 as a consequence of major changes in student interests. Displays 12 and 13 quantify these important changes at the baccalaureate and master levels while Displays 14 and 15 show these changes graphically and emphasize the differences between the University of Missouri system and the other public four-year institutions. At the baccalaureate level statewide major reductions in the absolute number of degrees awarded occurred in education, letters, and social sciences which were offset by growth in other areas, especially in business, engineering, public affairs, and computer science. Overall, eight baccalaureate disciplines declined while twelve increased in terms of degrees awarded. Only one remained essentially unchanged. At the master degree level the story is essentially the same: education, letters, and social sciences declined sharply while business, public affairs, and health professions enjoyed substantial increases. Significantly, engineering had the second largest decline at the master degree level, and this accurately reflects a serious national trend of fewer graduate degrees in this discipline. The following tabulation summarizes these trends.

DISPLAY 12
BACHELOR DEGREES CONFERRED
MISSOURI PUBLIC FOUR-YEAR INSTITUTIONS, 1972 AND 1982

	Discipline	UM System 1972	UM System 1982	UM System % Chg.	Other Public 4-year 1972	Other Public 4-year 1982	Other Public 4-year % Chg.	TOTAL 1972	TOTAL 1982	TOTAL % Chg.
0100	Agriculture & Natural Resources	272	445	63.6	200	331	65.5	472	776	64.4
0200	Architecture & Environmental Design	--	--	--	--	5	*	--	5	*
0300	Area Studies	7	6	(14.3)	2	--	(100.0)	9	6	(33.3)
0400	Biological Sciences	198	245	23.7	230	199	(13.5)	428	444	3.7
0500	Business & Management	756	1,260	66.7	1,360	1,993	46.5	2,116	3,253	53.7
0600	Communications	317	346	9.1	23	276	1,100.0	340	622	82.9
0700	Computer & Information Science	55	74	34.5	19	252	1,226.3	74	326	340.5
0800	Education	1,035	734	(29.1)	3,107	1,806	(41.9)	4,142	2,540	(38.7)
0900	Engineering	1,035	1,319	27.4	178	451	153.4	1,213	1,770	45.9
1000	Fine & Applied Arts	100	138	38.0	123	161	30.9	223	299	34.1
1100	Foreign Languages	113	49	(56.6)	73	33	(54.8)	186	82	(55.9)
1200	Health Professions	248	283	14.1	88	303	244.3	336	586	74.4
1300	Home Economics	135	161	19.3	47	174	270.2	182	335	84.1
1400	Law	--	--	--	--	--	--	--	--	--
1500	Letters	529	277	(47.6)	422	188	(55.5)	951	465	(51.1)
1600	Library Science	12	4	(66.7)	11	4	(63.6)	23	8	(65.2)
1700	Mathematics	161	39	(75.8)	112	57	(49.1)	273	96	(64.8)
1800	Military Sciences	--	--	--	--	--	--	--	--	--
1900	Physical Sciences	196	163	(16.8)	131	145	10.7	327	308	(5.8)
2000	Psychology	231	202	(12.6)	216	245	13.4	447	447	0.0
2100	Public Affairs & Service	110	228	107.3	183	555	203.3	293	783	167.2
2200	Social Sciences	983	482	(51.0)	1,004	309	(69.2)	1,987	791	(60.2)
2300	Theology	--	--	--	--	--	--	--	--	--
4900	Interdisciplinary Studies	14	218	1,457.1	4	88	2,100.0	18	306	1,600.0
	TOTAL	**6,507**	**6,673**	**2.6**	**7,533**	**7,575**	**0.6**	**14,040**	**14,248**	**1.5**

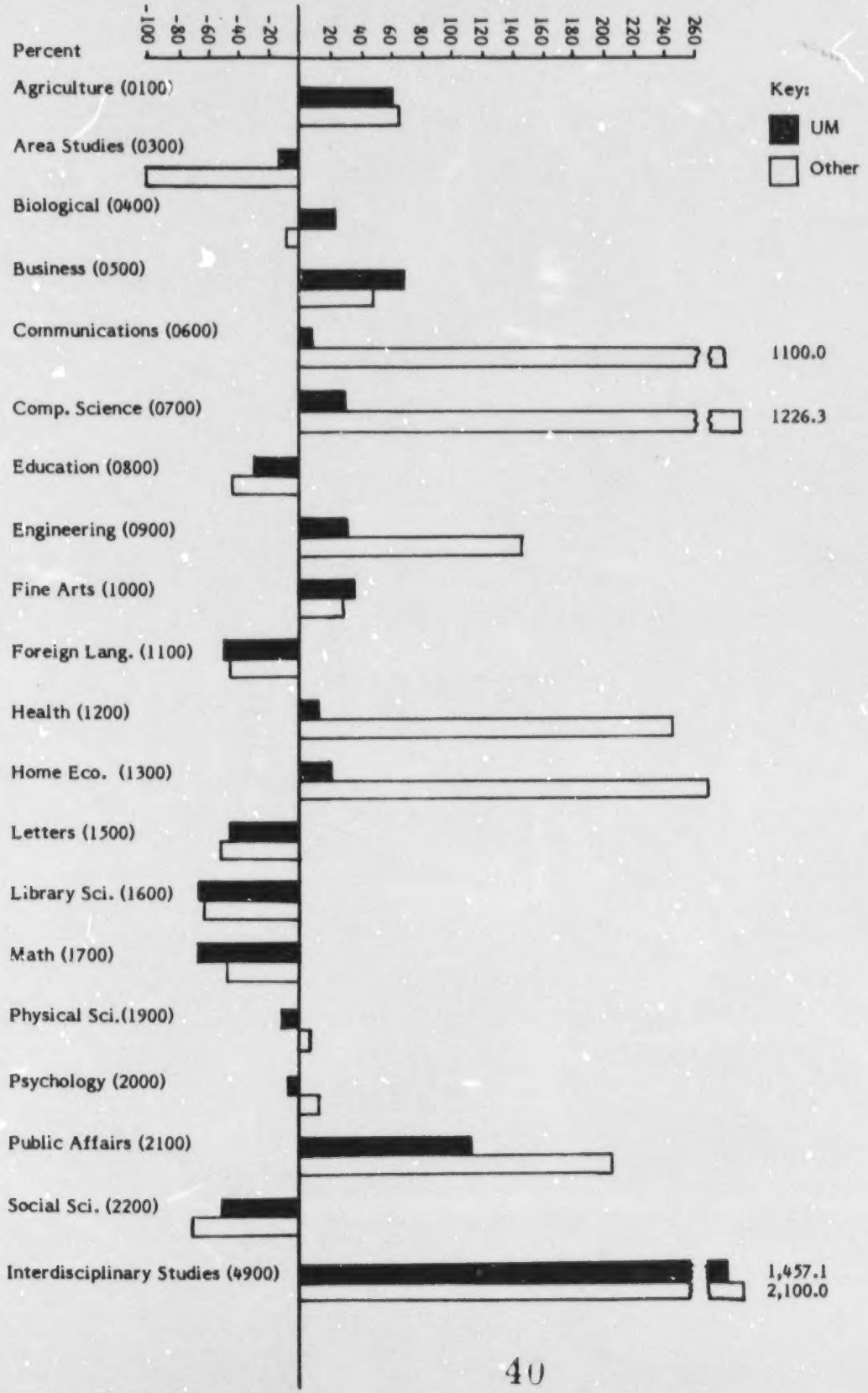
*Percent Change Undefined; No Degree Program in 1972

DISPLAY 13
MASTER DEGREES CONFERRED
MISSOURI PUBLIC FOUR-YEAR INSTITUTIONS, 1972 AND 1982

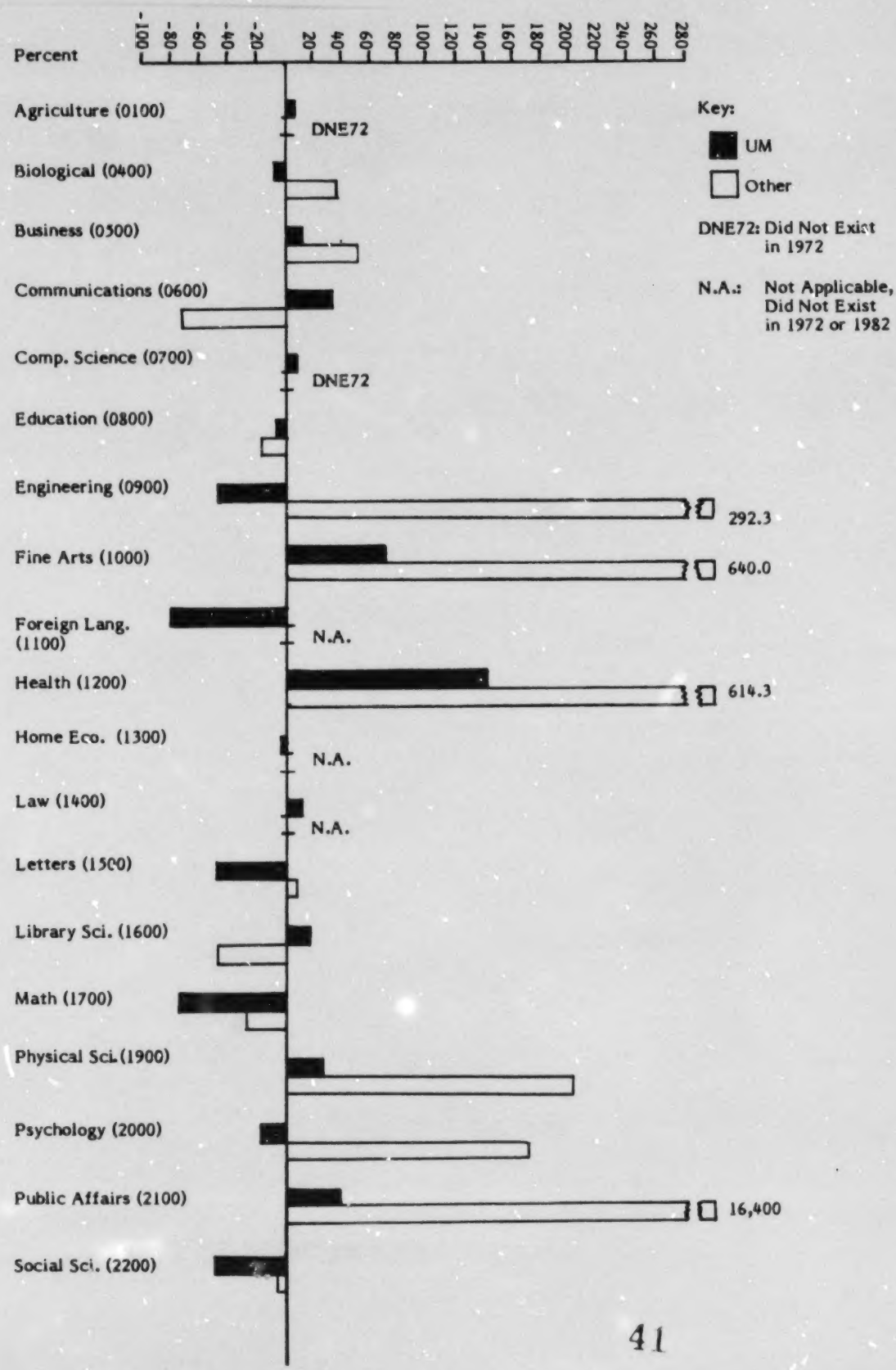
	Discipline	UM System			Other Public 4-year			TOTAL		
		1972	1982	% Chg.	1972	1982	% Chg.	1972	1982	% Chg.
0100	Agriculture & Natural Resources	70	71	1.4	--	8	*	70	79	12.9
0200	Architecture & Environmental Design	--	--	--	--	4	*	--	4	*
0300	Area Studies	--	--	--	--	--	--	--	--	--
0400	Biological Sciences	55	51	(7.3)	18	25	38.9	73	76	4.1
0500	Business & Management	261	288	10.3	82	129	57.3	343	417	21.6
0600	Communications	62	81	30.6	12	3	(75.0)	74	84	13.5
0700	Computer & Information Science	31	34	9.7	--	4	*	31	38	22.6
0800	Education	944	874	(7.4)	1,203	985	(18.1)	2,147	1,859	(13.4)
0900	Engineering	502	271	(46.0)	13	51	292.3	515	322	(37.5)
1000	Fine & Applied Arts	40	67	67.5	5	37	640.0	45	104	131.1
1100	Foreign Languages	30	5	(83.3)	--	--	--	30	5	(83.3)
1200	Health Professions	47	114	142.6	7	50	614.3	54	164	203.7
1300	Home Economics	20	19	(5.0)	--	--	--	20	19	(5.0)
1400	Law	20	22	10.0	--	--	--	20	22	10.0
1500	Letters	97	46	(52.6)	52	55	5.8	149	101	(32.2)
1600	Library Science	60	67	11.7	15	7	(53.3)	75	74	(1.3)
1700	Mathematics	58	16	(72.4)	12	8	(33.3)	70	24	(65.7)
1800	Military Sciences	--	--	--	--	--	--	--	--	--
1900	Physical Sciences	54	66	22.2	4	12	200.0	58	78	34.5
2000	Psychology	39	30	(23.1)	14	38	171.4	53	68	28.3
2100	Public Affairs & Service	120	166	38.3	1	165	16,400.0	121	331	173.6
2200	Social Sciences	214	108	(49.5)	80	73	(8.8)	294	181	(38.4)
2300	Theology	--	--	--	--	--	--	--	--	--
4900	Interdisciplinary Studies	--	--	--	--	11	*	--	11	*
	TOTAL	**2,724**	**2,396**	**(12.0)**	**1,518**	**1,665**	**9.7**	**4,242**	**4,061**	**(4.3)**

*Percent Change Undefined; No Degree Program in 1972.

DISPLAY 14
PERCENT CHANGE IN BACHELOR DEGREES CONFERRED
FOR SELECTED DISCIPLINES
MISSOURI PUBLIC FOUR-YEAR INSTITUTIONS
1972-1982



DISPLAY 15
PERCENT CHANGE IN MASTER DEGREES CONFERRED FOR SELECTED DISCIPLINES MISSOURI PUBLIC FOUR-YEAR INSTITUTIONS 1972 - 1982



DISPLAY 16
FOUR DISCIPLINES WITH THE LARGEST CHANGES
IN ACTUAL DEGREES CONFERRED
MISSOURI PUBLIC FOUR-YEAR INSTITUTIONS, 1972-1982

Bachelor		Master	
Increased	Decreased	Increased	Decreased
Business	Education	Public Affairs	Education
Engineering	Social Sciences	Health Professions	Engineering
Public Affairs	Letters	Business	Social Sciences
Agriculture	Mathematics	Fine Arts	Letters

The profound impact these changes had on the institutions cannot be overstated. Long before the state's current fiscal crisis, the institutions had to reallocate institutional resources because of inflation and very significant shifts in student interests.

Summary Observations

Notwithstanding apparently level total degree production between 1972 and 1982, this was a period of important shifts in degree productivity, especially at the graduate level. Furthermore, the institutions seemed to exhibit the ability to smooth out the rises and falls in enrollment patterns during the period. More significantly, very substantial shifts occurred in the patterns of student interests at both the bachelor and master degree levels, and these shifts necessitated the diversion of resources into growth areas.

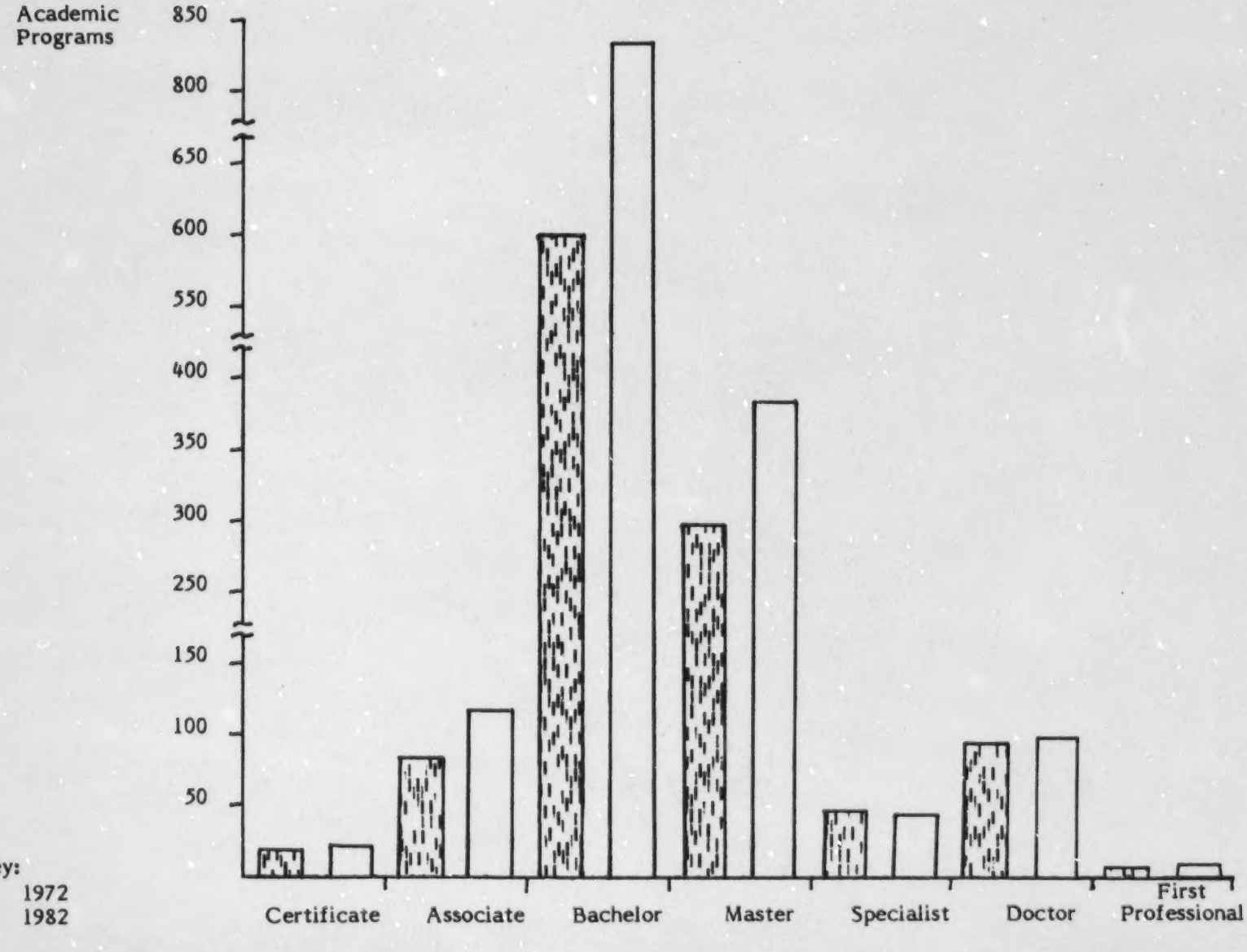
NEW PROGRAM DEVELOPMENT AND DEGREE PRODUCTIVITY

The period 1972-1982 has been a time of significant change and innovation in the portfolios of instructional programs maintained by Missouri's public four-year institutions. Sluggish enrollment, changing student interests, and institutional aspirations combined to produce major additions to the curricula of these institutions. Displays 17 and 18 demonstrate how these additions were distributed among the degree levels and between the two major institution groups. In general, the additions were not concentrated in one type of institution; and, overall, a comparison of the official program inventories for 1972 and 1982 shows a net increase in programs from 1,138 to 1,500 for a 31.8% gain.

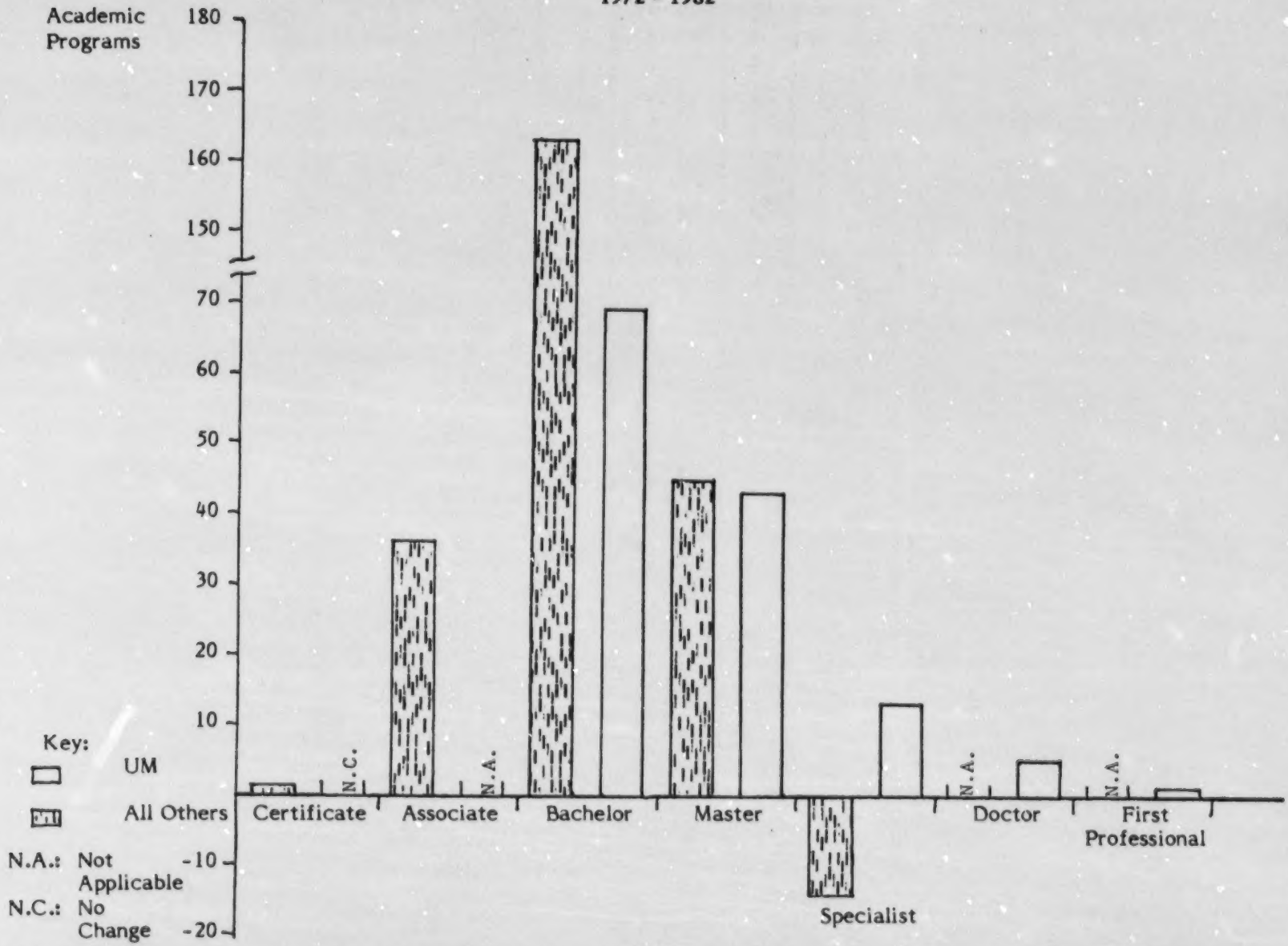
Although these figures indicate strong growth, they clearly understate the total extent of program development and innovation. Some programs were dropped or consolidated while numerous concentration options which do not appear on the inventories were added to freestanding majors. A specific example of the former is the fact that the number of specialist programs decreased by one simply because one institution consolidated seventeen programs while all of the others established sixteen new ones. The strategy of creating specialized degree options (that is, a specifically designated area of concentration within the major field of study) appears to be the institutions' response to the widely reported student interest in programs with specific career objectives. Typically, these options do not individually constitute major program additions, but rather represent a repackaging of existing offerings. It is, however, a concern of the Coordinating Board's staff that in the long run this multiplication of options constitutes a fragmentation of the curriculum and leads to a proliferation of upper division courses.

It is clear that programmatic growth has outpaced degree productivity growth, as Display 19 demonstrates. Only at the associate and first professional levels did degree production increase more than program growth. At the baccalaureate level, degrees awarded increased 1.5% while programs increased 38.8% and at all other levels degrees awarded actually decreased.

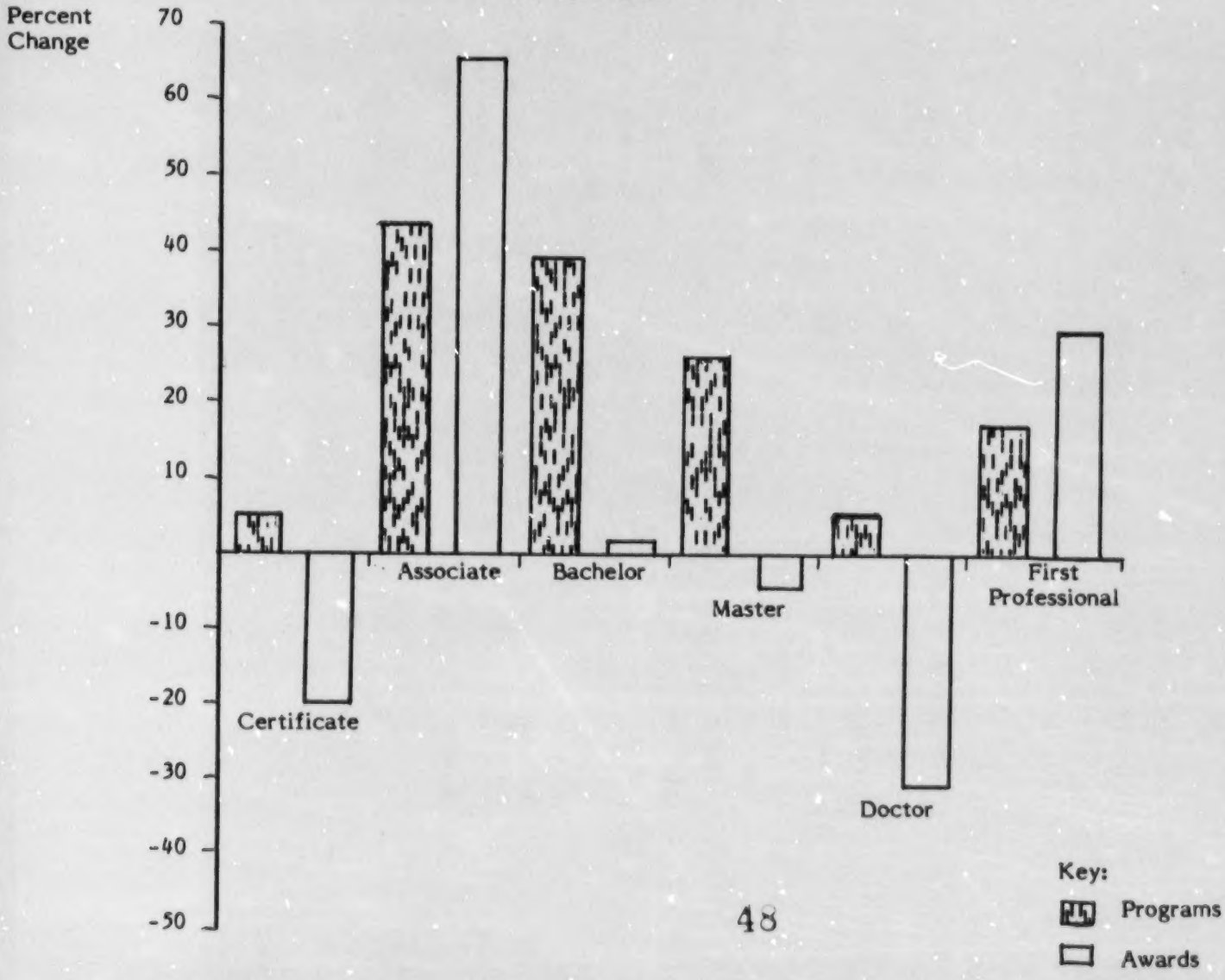
DISPLAY 17
ACADEMIC PROGRAMS AUTHORIZED
MISSOURI PUBLIC FOUR-YEAR INSTITUTIONS
1972 AND 1982



DISPLAY 18
NET AUTHORIZED ACADEMIC PROGRAM ADDITIONS
MISSOURI PUBLIC FOUR-YEAR INSTITUTIONS
1972 - 1982



DISPLAY 19
PERCENT CHANGE IN ACADEMIC PROGRAMS AUTHORIZED
VERSUS
PERCENT CHANGE IN DEGREES CONFERRED
MISSOURI PUBLIC FOUR-YEAR INSTITUTIONS
1972-1982



One of the net consequences of this phenomenon is a relatively large number of bachelor degree majors producing very few graduates annually, as detailed in Displays 20 and 21. Display 20 shows that between 1979 and 1982 only four disciplines - business, engineering, psychology, and public affairs - had fewer than 25% of their programs producing less than six graduates each year while two disciplines - area studies and foreign languages - had more then 75% of their programs producing five or fewer degrees in each of those years. (Due to variations in degree reporting practices and the fact that degrees from more than one program are frequently reported together, these figures should be treated as estimates only.)

Averaging all baccalaureate programs and disciplines over these four years shows that 47.9% of all programs produced five or fewer degrees annually. Although a percentage of low productivity programs will always exist due to the fact that some disciplines fulfill service functions within the institutions, these data suggest that the current percentage is excessive. Aside from the negative fiscal considerations of this situation, serious academic questions are posed. What are the intellectual consequences of this segmentation of the curriculum? Do these small programs generate a sufficient critical mass of students to assure quality educational experiences? Is it in the students' best long-term interests to follow narrowly targeted career programs at the baccalaureate level? It seems clear that these issues deserve the full attention of the educational community in Missouri.

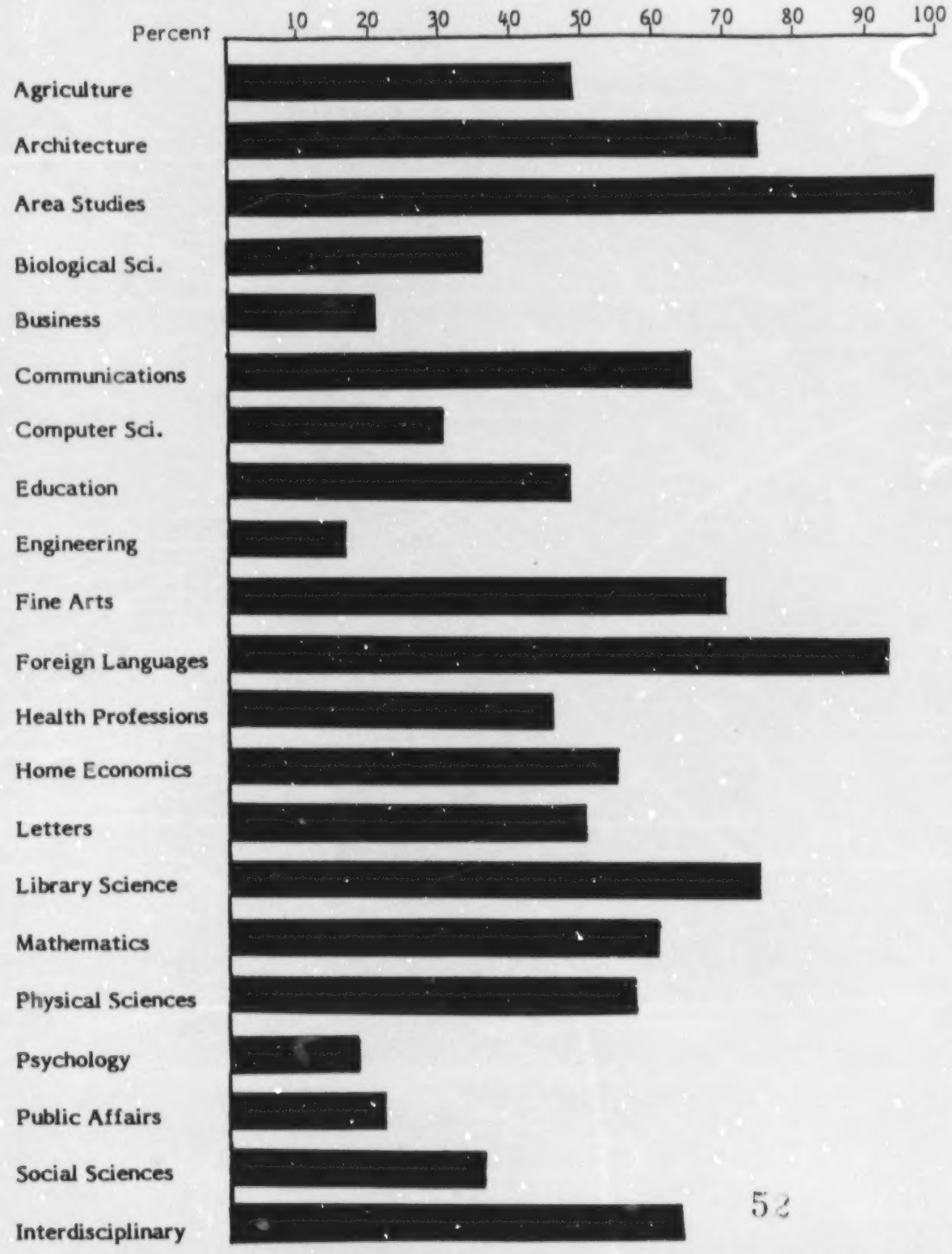
DISPLAY 20
BACHELOR DEGREE PROGRAMS CONFERRING 0-5 DEGREES
MISSOURI PUBLIC FOUR-YEAR INSTITUTIONS, 1979-1982

Discipline	FY 1979 Prog. with 0-5 Degrees	FY 1979 % of Total	FY 1980 Prog. with 0-5 Degrees	FY 1980 % of Total	FY 1981 Prog. with 0-5 Degrees	FY 1981 % of Total	FY 1982 Prog. with 0-5 Degrees	FY 1982 % of Total	Total Number of Programs on Inventory per Discipline
Agriculture	27	51.9%	24	46.2%	27	51.9%	24	46.2%	52
Architecture	1	100.0	0	0.0	1	100.0	1	100.0	1
Area Studies	9	100.0	9	100.0	9	100.0	9	100.0	9
Biological Sciences	9	33.3	10	37.0	7	25.9	12	44.4	27
Business	12	24.0	10	20.0	9	18.0	11	22.0	50
Communications	17	65.4	19	73.1	17	65.4	15	57.7	26
Computer Science	6	46.2	4	30.8	3	23.1	3	23.1	13
Education	89	47.1	95	50.3	96	50.8	87	46.0	189
Engineering	10	21.7	10	21.7	8	17.4	3	6.5	46
Fine Arts	34	58.6	43	74.1	44	75.9	43	74.1	58
Foreign Languages	37	94.9	36	92.3	37	94.9	36	92.3	39
Health	19	52.8	16	44.4	17	47.2	14	38.9	36
Home Economics	24	60.0	19	47.5	26	65.0	21	52.5	40
Letters	23	52.3	23	52.3	25	56.8	18	40.9	44
Library Science	0	0.0	2	100.0	2	100.0	2	100.0	2
Mathematics	10	58.8	8	47.1	11	64.7	12	70.6	17
Physical Science	27	60.0	23	51.1	27	60.0	26	57.8	45
Psychology	4	22.2	3	16.7	3	16.7	3	16.7	18
Public Affairs	6	18.2	8	24.2	8	24.2	7	21.2	33
Social Sciences	21	29.6	25	35.2	27	38.0	29	40.8	71
Interdisciplinary	11	64.7	12	70.6	12	70.6	8	47.1	17
TOTAL	**396**	**47.5%**	**399**	**47.9%**	**416**	**49.9%**	**384**	**46.1%**	**833**

Notes: Zero (0) means that at least six degrees were awarded in each program in the discipline. Programs in which degrees were conferred, but are not listed in the program inventory, are not included on table.

Due to the format in which the data are reported, these figures are best estimates.

DISPLAY 21
AVERAGE PERCENT OF BACHELOR DEGREE PROGRAMS CONFERRING 0 - 5 DEGREES MISSOURI PUBLIC FOUR-YEAR INSTITUTIONS 1979 - 1982



Summary Observations

During the period 1972-1982 Missouri's public four-year institutions aggressively expanded their program offerings to satisfy a perceived demand for greater diversity in the curricula of institutions. This growth was broadly based across most disciplines and most institutions. At the same time that enrollment increased 14.3% and degrees conferred increased 0.9%, new programs increased 31.8%. While this phenomenon greatly increased geographic access, consequences of this activity have also included highly segmented curricula, narrowly focused professional programs at the baccalaureate level, and a multiplicity of low productivity programs. The impact of this programmatic growth and the trade-offs that it has imposed on the institutions and their students would be an appropriate topic for further consideration by the Coordinating Board.

PRODUCTIVITY MEASURES

A logical conclusion of the previous analysis suggests that while institutions have actively redirected their resources throughout the period 1972 to 1982 to promote growth, the combination of a proliferation of degree majors, significant shifts in student interests, inflation induced erosion of the institutions' financial base, and declining state support have produced a radically altered environment for the higher education community. This new environment demands a greater degree of management skill, and lack of attention to this issue could threaten the quality of the educational product. If this judgment is valid, the Coordinating Board may decide it is appropriate to devote more of its attention to monitoring productivity measures for disciplines, and perhaps individual programs, to gain better insight into the dynamics of resource allocations for instructional programs. The possibilities for this type of study are demonstrated in the following analysis of five productivity measures for the period 1972-1982: two input measures, (Instructional Expenditures Adjusted for Inflation and Full-time Instructional/Research Staff); and three output measures, (Credit Hours Produced, Credit Hours per Full-time Instructional/Research Staff, and Expenditures per Credit Hour). This model is a useful learning device helpful in the formulation of specific questions and issues warranting further study, but specific policy decisions should await more thorough analysis.

Displays 22-24 summarize the values achieved by all of the academic disciplines on the five productivity measures at the University of Missouri system, at all other public four-year institutions, and for the state's four-year system as a whole. The scores varied widely among the disciplines; but, as Display 25 indicates, the average scores achieved on these measures by the institutional groupings showed only marginal variations.

DISPLAY 22
SUMMARY OF PRODUCTIVITY MEASURES
PUBLIC FOUR - YEAR INSTITUTIONS, EXCEPT UNIVERSITY OF MISSOURI, 1979-1982

	Percent Change Full-time Instructional/ Research Staff	Percent Change Credit Hours Produced	Percent Change Credit Hours Per FT I/R Staff	Percent Change Instructional Expenditures Inflation Adjusted	Percent Change Expenditures Per Credit Hour
Agriculture & Natural Resources	24.1%	15.8%	(6.7)%	(5.5)%	(18.4)%
Architecture & Environmental Design	--	(21.0)	--	(30.0)	(11.3)
Area Studies	--	--	--	--	--
Biological Sciences	(3.0)	6.2	9.4	(12.6)	(17.7)
Business & Management	6.5	20.7	13.3	3.0	(14.7)
Communications	40.0	70.2	21.5	11.4	(34.5)
Computer & Information Sciences	88.2	96.4	4.3	53.8	(21.7)
Education	(10.6)	2.5	14.6	(14.7)	(16.8)
Engineering	7.0	26.8	18.5	(0.5)	(21.6)
Fine & Applied Arts	0.4	0.9	0.5	(14.8)	(15.6)
Foreign Languages	11.4	11.4	0.0	(5.5)	(15.2)
Health Professions	9.5	15.0	5.0	10.0	(4.4)
Home Economics	(1.8)	(1.9)	(0.1)	(6.3)	(4.5)
Law	--	(100.0)	--	--	--
Letters	6.7	9.7	2.8	(4.6)	(13.0)
Library Science	(14.3)	10.0	28.3	(39.7)	(45.2)
Mathematics	0.9	24.3	23.1	(2.1)	(21.2)
Military Science	86.7	36.4	(26.9)	(15.4)	(38.0)
Physical Sciences	0.8	10.2	9.3	(13.8)	(21.8)
Psychology	3.4	(0.6)	(3.8)	(13.2)	(12.7)
Public Affairs & Services	(9.8)	5.6	17.1	(3.9)	(9.0)
Social Sciences	1.2	5.9	4.6	(10.6)	(15.5)
Theology	--	--	--	--	--
Interdisciplinary Studies	400.0	99.2	--	3.5	(48.1)
Business & Commerce Technology	125.0	(22.2)	(65.4)	44.2	85.3
Data Processing Technology	50.0	30.6	(12.9)	16.2	(11.1)
Health Services & Paramedical Technology	43.5	59.5	11.2	(8.3)	(42.5)
Mechanical & Engineering Technology	45.5	(12.9)	(40.1)	64.2	88.5
Natural Science Technology	--	(97.5)	--	--	--
Public Service Related Technology	(22.2)	(4.9)	22.3	(5.2)	0.0
OVERALL AVERAGE	**2.9%**	**11.7%**	**8.6%**	**(6.6)%**	**(16.4)%**

DISPLAY 23
SUMMARY OF PRODUCTIVITY MEASURES
UNIVERSITY OF MISSOURI, 1979-1982

	Percent Change Full-time Instructional/ Research Staff	Percent Change Credit Hours Produced	Percent Change Credit Hours Per FT I/R Staff	Percent Change Instructional Expenditures Inflation Adjusted	Percent Change Expenditures Per Credit Hour
Agriculture & Natural Resources	8.2%	(3.8)%	(11.1)%	(15.5)%	(12.2)%
Architecture & Environmental Design	--	--	--	--	--
Area Studies	--	(92.3)	--	--	--
Biological Sciences	11.7	(1.3)	(11.6)	(1.0)	0.3
Business & Management	0.0	13.5	13.5	3.1	(9.2)
Communications	6.8	9.1	2.1	(19.7)	(26.4)
Computer & Information Sciences	(5.0)	83.3	92.9	(22.6)	(57.8)
Education	4.9	0.1	(4.6)	(4.9)	(5.0)
Engineering	5.4	25.1	18.7	(0.1)	(20.1)
Fine & Applied Arts	(0.7)	13.8	14.6	(5.3)	(16.8)
Foreign Languages	(9.6)	14.4	26.5	(14.1)	(24.9)
Health Professions	12.2	8.6	(3.2)	(1.2)	(9.1)
Home Economics	(2.9)	(6.1)	(3.3)	(11.1)	(5.3)
Law	5.1	1.8	(3.2)	(5.1)	(6.8)
Letters	9.5	9.5	0.0	(9.5)	(17.3)
Library Science	0.0	11.3	11.3	62.4	46.0
Mathematics	(5.6)	21.5	28.6	(3.1)	(20.2)
Military Science	--	75.7	--	3.9	(40.9)
Physical Sciences	(2.5)	9.9	12.7	(9.3)	(17.5)
Psychology	9.0	3.6	(4.9)	(15.1)	(18.1)
Public Affairs & Services	22.2	(7.7)	(24.5)	6.1	15.0
Social Sciences	(12.3)	7.9	23.1	(17.6)	(23.6)
Theology	--	--	--	--	--
Interdisciplinary Studies	(100.0)	99.6	--	(5.7)	(52.7)
Business & Commerce Technology	--	22.1	--	--	--
Public Service Related Technology	--	(100.0)	--	--	--
OVERALL AVERAGE	**1.9%**	**10.7%**	**8.7%**	**(5.7)%**	**(14.8)%**

DISPLAY 24
SUMMARY OF PRODUCTIVITY MEASURES
MISSOURI PUBLIC FOUR-YEAR INSTITUTIONS, 1979-1982

	Percent Change Full-time Instructional/ Research Staff	Percent Change Credit Hours Produced	Percent Change Credit Hours Per FT I/R Staff	Percent Change Instructional Expenditures Inflation Adjusted	Percent Change Expenditures Per Credit Hour
Agriculture & Natural Resources	16.5%	4.0%	(10.7)%	(11.9)%	(15.3)%
Architecture & Environmental Design	--	(21.0)	--	(30.0)	(11.3)
Area Studies	--	(92.3)	--	--	--
Biological Sciences	3.4	2.5	(0.9)	(5.2)	(7.5)
Business & Management	4.1	17.9	13.2	3.0	(12.6)
Communications	15.3	35.1	17.2	(11.3)	(34.3)
Computer & Information Sciences	37.8	92.1	39.4	21.8	(36.6)
Education	(5.9)	1.6	7.9	(10.9)	(12.4)
Engineering	5.7	25.5	18.8	(0.2)	(20.5)
Fine & Applied Arts	0.0	5.4	5.4	(10.5)	(15.0)
Foreign Languages	(1.7)	13.5	15.4	(11.3)	(21.8)
Health Professions	11.5	9.6	(1.7)	(0.4)	(9.1)
Home Economics	(2.2)	(3.6)	(1.4)	(8.9)	(5.5)
Law	5.1	0.3	(4.6)	(5.1)	(5.4)
Letters	7.6	9.6	1.9	(6.7)	(14.9)
Library Science	(11.5)	10.4	24.8	10.7	0.3
Mathematics	(2.3)	22.7	25.6	(2.7)	(20.7)
Military Science	86.7	44.6	(22.5)	(10.0)	(37.8)
Physical Sciences	(1.0)	10.0	11.2	(10.8)	(18.9)
Psychology	5.8	1.1	(4.5)	(14.2)	(15.1)
Public Affairs & Services	3.8	0.8	(2.9)	0.6	(0.2)
Social Sciences	(5.5)	6.8	13.0	(14.6)	(20.1)
Theology	--	--	--	--	--
Interdisciplinary Studies	400.0	99.4	199.1	(0.3)	(50.0)
Business & Commerce Technology	125.0	(16.8)	(63.0)	44.2	73.3
Data Processing Technology	50.0	30.6	(12.9)	16.2	(11.1)
Health Services & Paramedical Technology	43.5	59.5	11.2	(8.3)	(42.5)
Mechanical & Engineering Technology	45.5	(12.9)	(40.1)	64.2	88.5
Natural Science Technology	--	(97.5)	--	--	--
Public Service Related Technology	(22.2)	(5.2)	21.9	(5.2)	0.0
OVERALL AVERAGE	**2.4%**	**11.2%**	**8.6%**	**(6.0)%**	**(15.5)%**

DISPLAY 25
SUMMARY OF PRODUCTIVITY MEASURES
FOR ALL ACADEMIC DISCIPLINES
MISSOURI PUBLIC FOUR-YEAR INSTITUTIONS, 1979-1982

	UM	All Others	Combined Total
Percent Change in Full-time Instructional/Research Staff	1.9%	2.9%	2.4%
Percent Change in Instructional Expenditures, Adjusted for Inflation	(5.7)	(6.6)	(6.0)
Percent Change in Credit Hours Produced	10.7	11.7	11.2
Percent Change in Credit Hours per Full-time Instructional Staff	8.7	8.6	8.6
Percent Change in Expenditures per Credit Hour	(14.8)	(16.4)	(15.5)

Overall, between the years 1979 and 1982, instructional and research staff increased 2.4% statewide while inflation adjusted expenditures decreased 6.0%. Credit hours were up 11.2% while credit hour productivity per staff member increased 8.6%. Inflation adjusted expenditures per credit hour decreased a substantial 15.5%. For all of the four-year institutions combined, inflation adjusted expenditures per credit hour increased in only three disciplines and remained constant in only one other. All of the remaining disciplines declined in terms of constant dollars. This pattern indicates that the higher education institutions slightly expanded their instructional/research staff and services during a period of modest enrollment growth and moderate constant dollar expenditure declines. Apparently, these staff additions were funded from real dollar increases while per unit support in constant dollars of base activities was permitted to erode. One conclusion that might be drawn from this scenario is that if this condition were to persist, serious injury to the institutions' ability to sustain high quality instructional programming would result. Nevertheless, in terms of credit hours per full-time instructional/research staff and constant

dollar expenditures per credit hour, the institutions produced noticeable productivity gains.

To gain a better understanding of the differential impact these policies have had on the academic disciplines, a crosstabulation model developed by the Illinois Board of Higher Education was adapted to the Missouri situation. All disciplines reporting credit hours and instructional expenditures were assigned to one of four categories depending on whether their reported credit hours had increased or decreased more than the average (mean) for all disciplines in the institution group and whether their inflation adjusted expenditures per credit hour had increased or decreased more than the average (mean) for all disciplines. In Displays 26-28, **BOLD CAPITAL** letters indicate which disciplines had a percentage increase in staff greater than average and underlining indicates which disciplines had a percentage change in credit hours per staff member that was less than average.

DISPLAY 26

CROSSTABULATION OF PERCENT CHANGE IN CREDIT HOUR PRODUCTION VERSUS PERCENT CHANGE IN INSTRUCTIONAL EXPENDITURES PER CREDIT HOUR FOR ALL DISCIPLINES MISSOURI PUBLIC FOUR-YEAR INSTITUTIONS, EXCEPT UNIVERSITY OF MISSOURI 1979-1982

	Percent Increase in Credit Hour Production Greater Than Group Mean	Percent Increase in Credit Hour Production Less Than Group Mean
Percent Decline in Expenditures per Credit Hour Less Than Group Mean (Relatively More Dollars Available per Unit)	I **BUSINESS**[1] **HEALTH PROFESSIONS**[1] **DATA PROCESSING TECHNOLOGY**[1]	II Architecture* Fine Arts* **FOREIGN LANGUAGES**** Home Economics* **LETTERS**** **PSYCHOLOGY*** Public Affairs** Social Sciences* **BUSINESS AND COMMERCE TECHNOLOGY**** **MECHANICAL AND ENGINEERING TECHNOLOGY**** Public Services Technology*
Percent Decline in Expenditures per Credit Hour Greater Than Group Mean (Relatively Fewer Dollars Available per Unit)	III **AGRICULTURE**# **COMMUNICATIONS**# **COMPUTER SCIENCE**# **ENGINEERING**# Mathematics# **MILITARY SCIENCE**# **INTERDISCIPLINARY STUDIES**# **HEALTH TECHNOLOGY**#	IV Biological Sciences[2] Education[2] Library Science[2] Physical Sciences[2]

KEY FOR DISPLAYS 26, 27, AND 28

#	Increase in Credit Hours is Greater Than Decline in Expenditures per Credit Hour -- Growth Out-Pacing Additional Investment per Unit.
##	Increase in Credit Hours is Less Than Decline in Expenditures per Credit Hour -- Declining Resources per Unit Despite Growth.
*	Increase in Expenditures per Credit Hour is Less Than Decline in Credit Hours -- Some Resource Reallocation Has Apparently Occurred But Not as Fast as Relative Decline for All Disciplines.
**	Increase in Expenditures per Credit Hour is Greater Than Decline in Credit Hours -- Growth Not Keeping Pace with Investment or Resource Reductions Have Not Been Initiated.
@	Increase in Expenditures per Credit Hour Greatly Exceeds Increase in Credit Hours -- a Condition of Overinvestment with Possible Need for Reallocation.
1	Increase in Expenditures per Credit Hour is Greater Than Increase in Credit Hours -- Potential for Imbalance Exists.
2	Decline in Expenditures per Credit Hour is Greater than Decline in Credit Hours -- Decline in Resources Out-Pacing Relative Decline for All Disciplines.
BOLD CAPS:	Percent Change in Full-time Instructional/Research Staff is Greater Than Average.
Underline:	Percent Change in Credit Hours per Full-time Instructional/Research Staff is Less Than Average.

DISPLAY 27

CROSSTABULATION OF
PERCENT CHANGE IN CREDIT HOUR PRODUCTION VERSUS
PERCENT CHANGE IN INSTRUCTIONAL EXPENDITURES PER CREDIT HOUR FOR ALL DISCIPLINES
UNIVERSITY OF MISSOURI
1979-1982

	Percent Increase in Credit Hour Production Greater Than Group Mean	Percent Increase in Credit Hour Production Less Than Group Mean
Percent Decline in Expenditures per Credit Hour Less Than Group Mean (Relatively More Dollars Available per Unit)	I Business1 Library Science@	II AGRICULTURE* BIOLOGICAL SCIENCES** EDUCATION* HEALTH PROFESSIONS** Home Economics* LAW* PUBLIC AFFAIRS**
Percent Decline in Expenditures per Credit Hour Greater Than Group Mean (Relatively Fewer Dollars Available per Unit)	III Computer Science# ENGINEERING# Fine Arts# Foreign Languages## Mathematics# Military Science# Interdisciplinary Studies#	IV COMMUNICATIONS2 LETTERS2 Physical Sciences2 PSYCHOLOGY2 Social Sciences2

KEY FOR DISPLAYS 26, 27, AND 28

#	Increase in Credit Hours is Greater Than Decline in Expenditures per Credit Hour -- Growth Out-Pacing Additional Investment per Unit.
##	Increase in Credit Hours is Less Than Decline in Expenditures per Credit Hour -- Declining Resources per Unit Despite Growth.
*	Increase in Expenditures per Credit Hour is Less Than Decline in Credit Hours -- Some Resource Reallocation Has Apparently Occurred But Not as Fast as Relative Decline for All Disciplines.
**	Increase in Expenditures per Credit Hour is Greater Than Decline in Credit Hours -- Growth Not Keeping Pace with Investment or Resource Reductions Have Not Been Initiated.
@	Increase in Expenditures per Credit Hour Greatly Exceeds Increase in Credit Hours -- a Condition of Overinvestment with Possible Need for Reallocation.
1	Increase in Expenditures per Credit Hour is Greater Than Increase in Credit Hours -- Potential for Imbalance Exists.
2	Decline in Expenditures per Credit Hour is Greater than Decline in Credit Hours -- Decline in Resources Out-Pacing Relative Decline for All Disciplines.
BOLD CAPS:	Percent Change in Full-time Instructional/Research Staff is Greater Than Average.
Underline:	Percent Change in Credit Hours per Full-time Instructional/Research Staff is Less Than Average.

DISPLAY 28

CROSSTABULATION OF PERCENT CHANGE IN CREDIT HOUR PRODUCTION VERSUS PERCENT CHANGE IN INSTRUCTIONAL EXPENDITURES PER CREDIT HOUR FOR ALL DISCIPLINES MISSOURI PUBLIC FOUR-YEAR INSTITUTIONS 1979-1982

	Percent Increase in Credit Hour Production Greater Than Group Mean	Percent Increase in Credit Hour Production Less Than Group Mean
Percent Decline in Expenditures per Credit Hour Less Than Group Mean Relatively More Dollars Available per Unit)	I **BUSINESS**[1] **DATA PROCESSING TECHNOLOGY**[1]	II **AGRICULTURE*** Library Science** Architecture* **LETTERS*** **BIOLOGICAL SCIENCES*** **PSYCHOLOGY*** Education* **PUBLIC AFFAIRS**** Fine Arts* **BUSINESS AND COMMERCE TECHNOLOGY**** **HEALTH PROFESSIONS**** **MECHANICAL AND ENGINEERING TECHNOLOGY**** Home Economics* Public Service Technology* **LAW***
Percent Decline in Expenditures per Credit Hour Greater Than Group Mean (Relatively Fewer Dollars Available Per Unit)	III **COMMUNICATIONS#** **COMPUTER SCIENCE#** **ENGINEERING#** Foreign Languages## Mathematics# **MILITARY SCIENCE#** **INTERDISCIPLINARY STUDIES#** **HEALTH TECHNOLOGY#**	IV Physical Sciences[2] Social Sciences[2]

KEY FOR DISPLAYS 26, 27, AND 28

#	Increase in Credit Hours is Greater Than Decline in Expenditures per Credit Hour -- Growth Out-Pacing Additional Investment per Unit.
##	Increase in Credit Hours is Less Than Decline in Expenditures per Credit Hour -- Declining Resources per Unit Despite Growth.
*	Increase in Expenditures per Credit Hour is Less Than Decline in Credit Hours -- Some Resource Reallocation Has Apparently Occurred But Not as Fast as Relative Decline for All Disciplines.
**	Increase in Expenditures per Credit Hour is Greater Than Decline in Credit Hours -- Growth Not Keeping Pace with Investment or Resource Reductions Have Not Been Initiated.
@	Increase in Expenditures per Credit Hour Greatly Exceeds Increase in Credit Hours -- a Condition of Overinvestment with Possible Need for Reallocation.
1	Increase in Expenditures per Credit Hour is Greater Than Increase in Credit Hours -- Potential for Imbalance Exists.
2	Decline in Expenditures per Credit Hour is Greater than Decline in Credit Hours -- Decline in Resources Out-Pacing Relative Decline for All Disciplines.
BOLD CAPS:	Percent Change in Full-time Instructional/Research Staff is Greater Than Average.
Underline:	Percent Change in Credit Hours per Full-time Instructional/Research Staff is Less Than Average.

Interpretation of Classification Model

Since inflation adjusted expenditures were negative for most disciplines, virtually all instructional programs were on a downward slope of decreasing resources. As a consequence, in this time of scarce resources, a discipline had a relative advantage if it lost less than the others. The interpretation of these classification tables should, therefore, be used simply to understand the relative status of the various instructional programs. The following comments apply in general terms to each program within a given category, but each case is unique and must be considered on its own merits.

Category I

All Category I programs enjoyed a percentage increase in credit hours produced above the average for all disciplines while their percentage increase in inflation adjusted expenditures per credit hour was also above the group average, i.e., although expenditures actually may have increased, it is more likely they decreased less than the others. These programs grew faster than average and, relatively speaking, received resources faster than the growth occurred. Ideally these disciplines were conscious targets of institutional investment, due either to growth or past underfunding, but the possibility exists that these disciplines were, or could in the future become, inflated by overinvestment and in that case would be targets for reallocation. From the perspective of the discipline, however, these programs were in a highly favored position.

DISPLAY 29
CATEGORY I DISCIPLINES
MISSOURI PUBLIC FOUR-YEAR INSTITUTIONS, 1979-1982

UM	All Others	Combined Total
Business Library Science@	Business Health Professions Data Processing Technology	Business Data Processing Technology

@ As Display 27 notes, this discipline appears to be in a state of overinvestment and may be a candidate for reallocation.

Category II

All disciplines in this category had a percentage increase in inflation adjusted expenditures per credit hour above the average for all disciplines, but their percentage increase in credit hours was below average. Since the credit hour average was positive for this period, these disciplines may have grown, but their rate of growth was below the institutional average. Programs within this category tended to fall into two general types. The first type is designated by a single asterisk (*), and for these disciplines the ratio of percent change in expenditures per credit hour to percent change in credit hour production suggested that the rise in expenditures per unit was less than the decline in credit hours. This relationship would appear to indicate that some resource reallocation had occurred, but the relative withdrawal of resources had not been as fast as the relative decline in credit hours. Disciplines of this type are probably reasonable targets for further resource reallocation. The other Category II type is designated by a double asterisk (**), and the data for these disciplines suggest that the relative rise in expenditures per unit above the average was greater than the relative decline in credit hours below the average. For disciplines in this situation, growth

either did not keep pace with allocations and lagged behind the institutional average, or resource reallocations had not been implemented to a significant degree. Any Category II discipline could be a reasonable target for resource reallocation if other institutional factors support this analysis.

DISPLAY 30
CATEGORY II DISCIPLINES
MISSOURI PUBLIC FOUR-YEAR INSTITUTIONS, 1979-1982

UM	All Others	Combined Total
Agriculture*	Architecture*	Agriculture*
Biological Sciences**	Fine Arts**	Architecture*
Education*	Foreign Languages**	Biological Sciences*
Health Professions**	Home Economics*	Education*
Home Economics*	Letters**	Fine Arts*
Law*	Psychology*	Health Professions**
Public Affairs**	Public Affairs**	Home Economics*
	Social Sciences*	Law*
	Business and Commerce Technology**	Library Science**
	Mechanical and Engineering Technology**	Letters*
	Public Services Technology*	Psychology*
		Public Affairs**
		Business and Commerce Technology**
		Public Service Technology*
		Mechanical and Engineering Technology**

Category III

Disciplines in Category III had credit hour production that grew faster than the institutional average while their unit expenditures per credit hour declined faster than the institutional average. From the institutional perspective these disciplines were highly desirable because their relative popularity made them revenue generators. However, the possibility exists that growth could exceed institutional investment to such a degree that quality could be adversely affected. As with Category II disciplines, programs in this category fell into two types. The most common type, designated by a single number sign (#), included those disciplines for which the percent increase in credit hours above the average was greater than the percent decline in expenditures per credit hour below the average. Generally speaking, the institutions made additional investment in these disciplines but growth outran these increased resources. The second type, which was relatively rare, included those disciplines for which the percent increase in credit hours above the average was less than the percent decline in expenditures per credit hour below the average. Disciplines of this type are designated by the double number sign (##), and they seem to have been targets of reallocation even though they grew faster than the institutional average. Should this situation persist, program quality could be adversely affected. All other things being equal, Category III disciplines could be logical targets for increased institutional investment if other institutional factors confirm this analysis.

DISPLAY 31
CATEGORY III DISCIPLINES
MISSOURI PUBLIC FOUR-YEAR INSTITUTIONS, 1979-1982

UM	All Others	Combined Total
Computer Science#	Agriculture#	Communications#
Engineering#	Communications#	Computer Science#
Fine Arts#	Computer Science#	Engineering#
Foreign Languages##	Engineering#	Foreign Languages##
Mathematics#	Mathematics#	Mathematics#
Military Science#	Military Science#	Military Science#
Interdisciplinary Studies#	Interdisciplinary Studies#	Interdisciplinary Studies#
	Health Technology#	Health Technology#

Category IV

Category IV disciplines had credit hour production that grew slower than the institutional average while their relative decline in expenditures per credit hour was faster than the institutional average. Disciplines in this category were in the weakest relative position of all institutional programs. These subject areas warrant very careful monitoring, and if this situation persists, they could become targets for termination, radical restructuring, or significantly increased institutional investments.

DISPLAY 32
CATEGORY IV DISCIPLINES
MISSOURI PUBLIC FOUR-YEAR INSTITUTIONS, 1979-1982

UM	All Others	Combined Total
Communications	Biological Sciences	Physical Sciences
Letters	Education	Social Sciences
Physical Sciences	Library Science	
Psychology	Physical Sciences	
Social Sciences		

Staff Size and Productivity

When the data on staff productivity are considered with this classification scheme, some very interesting results emerge. It is clear from Displays 26 - 28 that higher education institutions made the choice of above average investment not only in Category I and III disciplines, but also in Category II and IV disciplines. Although specific circumstances could warrant such decisions, it is critical that these investments occur as conscious management choices.

Sensitive use of this classification model can provide significant insight into the relative status of individual disciplines within a single institution or a group of similar institutions. It is important to be aware that the location of a discipline at any one time may be less significant than its longer term trend. For example, programs operating very near the institutional mean could easily slip from one category to another in succeeding years. Disciplines that persist in a particular category, however, warrant closer attention. Display 33 summarizes the results of this analysis. This tabulation shows that business was the only Category I discipline across the public four-year system while home economics and public affairs were Category II disciplines. Category III disciplines included computer science, engineering, mathematics, military science, and interdisciplinary studies. The only consistent Category IV discipline was physical sciences. This classification model could become a very useful management tool for institutions to assess the relative productivity and economic viability of their portfolio of instructional programs.

DISPLAY 33
COMPOSITE OF CROSSTABULATION CATEGORY CLASSIFICATIONS
OF PERCENT CHANGE IN CREDIT HOUR PRODUCTION VERSUS
PERCENT CHANGE IN INSTRUCTIONAL EXPENDITURES PER CREDIT HOUR
FOR ALL DISCIPLINES
MISSOURI PUBLIC FOUR-YEAR INSTITUTIONS, 1979-1982

	UM	Others	All
Agriculture & Natural Resources	II	III	II
Architecture and Environmental Design	--	II	II
Area Studies	--	--	--
Biological Sciences	II	IV	II
Business & Management*	I	I	I
Communications	IV	III	III
Computer & Information Sciences*	III	III	III
Education	II	IV	II
Engineering*	III	III	III
Fine & Applied Arts	III	II	II
Foreign Languages	III	II	III
Health Professions	II	I	II
Home Economics*	II	II	II
Law	II	--	II
Letters	IV	II	II
Library Science	I	IV	II
Mathematics*	III	III	III
Military Science*	III	III	III
Physical Sciences*	IV	IV	IV
Psychology	IV	II	II
Public Affairs*	II	II	II
Social Sciences	IV	II	IV
Theology	--	--	--
Interdisciplinary Studies*	III	III	III
Business & Commerce Technology	--	II	II
Data Processing Technology	--	I	I
Health & Paramedical Technology	--	III	III
Mechanical & Engineering Technology	--	II	II
Natural Science Technology	--	--	--
Public Services Technology	--	II	II

*Designates a discipline with the same classification in all three crosstabulations.

Summary Observations

Rapid growth in the number of degree programs, combined with modest enrollment growth, high inflation, and declining state support, has created a situation in which all degree programs and discipline areas require close observation to assure that they remain qualitatively and economically viable. To assist this effort, this report has identified five input/output productivity measures for instructional programs and has combined them for analytical purposes into a classification model that displays discipline performance on four dimensions. This scheme enables an institution to identify those disciplines that have received a significant infusion of resources recently, those disciplines that are logical targets for resource reallocations, those disciplines that are logical investment opportunities, and those disciplines that could be weakening to the point that they may no longer be economically viable. While no quantitative model alone can evaluate instructional programs out of their institutional contexts, this mode of analysis could be a valuable conceptual tool for the institutions and the Coordinating Board for Higher Education.